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WILDLIFE INVENTORY OF THE SALT WELLS AND PILOT BUTTE PLANNING UNITS, ROCK SPRINGS DISTRICT, U.S. BUREAU OF LAND MANAGEMENT

Contract No.: YA-512-CT9-288

Prepared by:

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I. INTRODUCTION

1.1 BACKGROUND

To ensure compliance with the Federal Land Policy and Management Act of 1976, the Rock Springs District of the Bureau of Land Management (BLM) in Wyoming contracted BioSystems Analysis, Inc. (BSAI) to conduct an inventory of selected wildlife resources (Contract No. YA-512-CT9-288).

The data obtained from this inventory are intended to aid BLM personnel in identifying impacts on wildlife resources associated with the possible recovery of subsurface coal.

The studies were designed to comply with established BLM procedures, most notably BLM Manual 6602, Integrated Habitat and Inventory Classification System (IHICS). Sixteen habitat types were sampled by inventorying 3-6 locations per habitat. The selection of habitat sites closely conformed to those sampled in earlier years by BLM to aid in comparison analyses.

1.2 APPROACH AND OBJECTIVES

The inventory concentrated primarily on quantitative studies of non-game birds, excluding diurnal raptors. The latter group was surveyed in the study area during 1979 by BLM personnel.

Amphibians and reptiles were surveyed for occurrence and relative abundance. In addition, white-tailed prairie dogs and black-footed ferrets were surveyed to determine occurrence and distribution. Special habitat features were recorded whenever located; however, many of these areas or features were already on file with the BLM.

A literature review was conducted which included selected annotations of similar inventories in Wyoming and adjacent states. The principal reference sources on the avifauna of Wyoming were Dorn et al (1978) and Oakleaf et al (1979). Inventories similar to the present study are few: the principal ones are Wyoming Game and Fish Department (1979), Fitton and Howe (1979), Martin and Dubois (1980) and Montana Department Fish, Wildlife and Parks (1980).

II. STUDY AREA

The Rock Springs District of the BLM is comprised of approximately 2.5 million hectares (6.2 million acres) of Great Basin habitat in southwestern Wyoming (Figure 1). The present study concentrated on the Salt Wells/ Pilot Butte Planning Units, which together comprise approximately 50% of the total District. All black-footed ferret searches were conducted in the KRCRA.

Figure 2 depicts the Rock Springs District in terms of townships. The reader is encouraged to refer to this grid for the approximate location of site references in text described in terms of township, range and section.

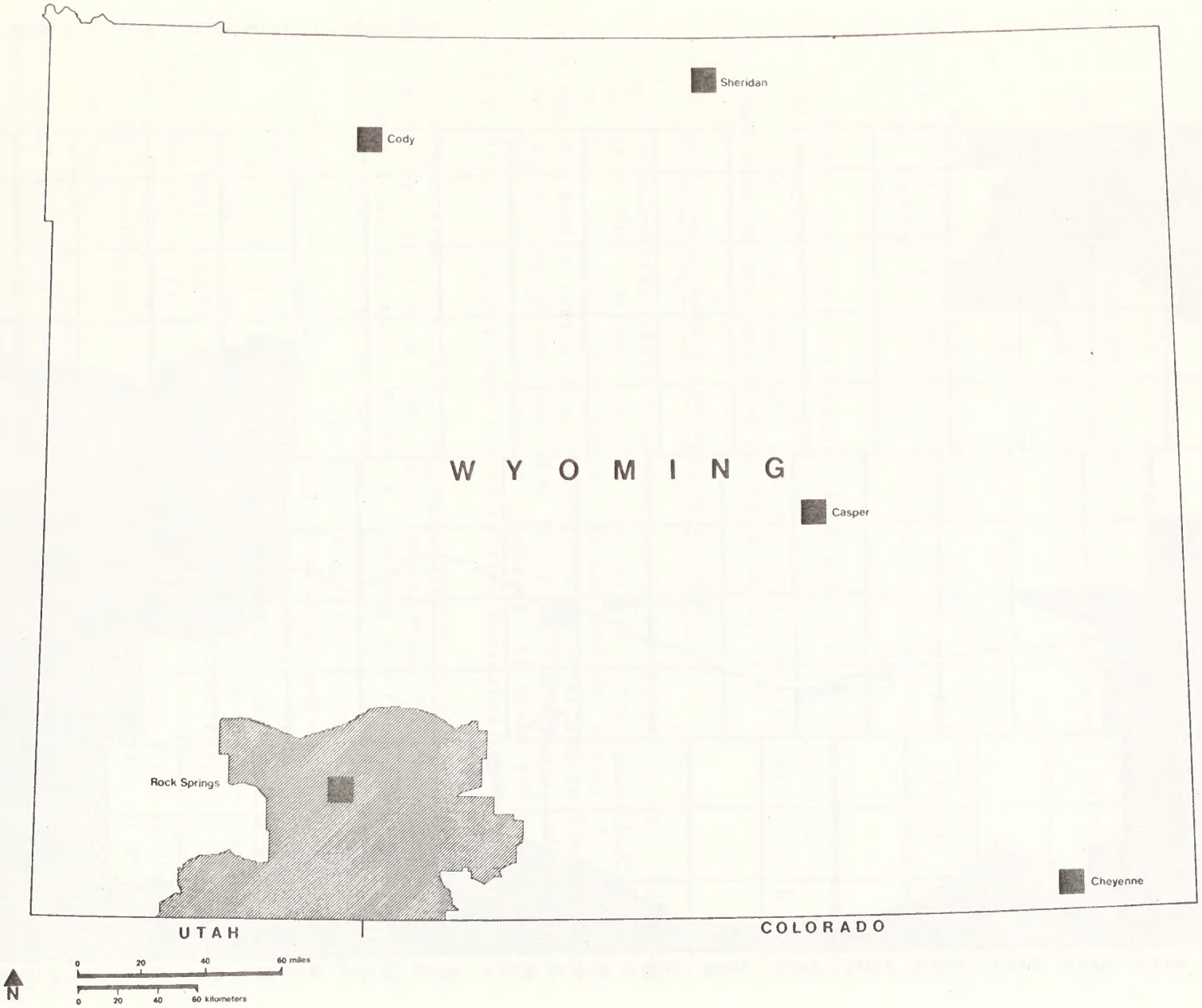


Figure 1 Map of study region.

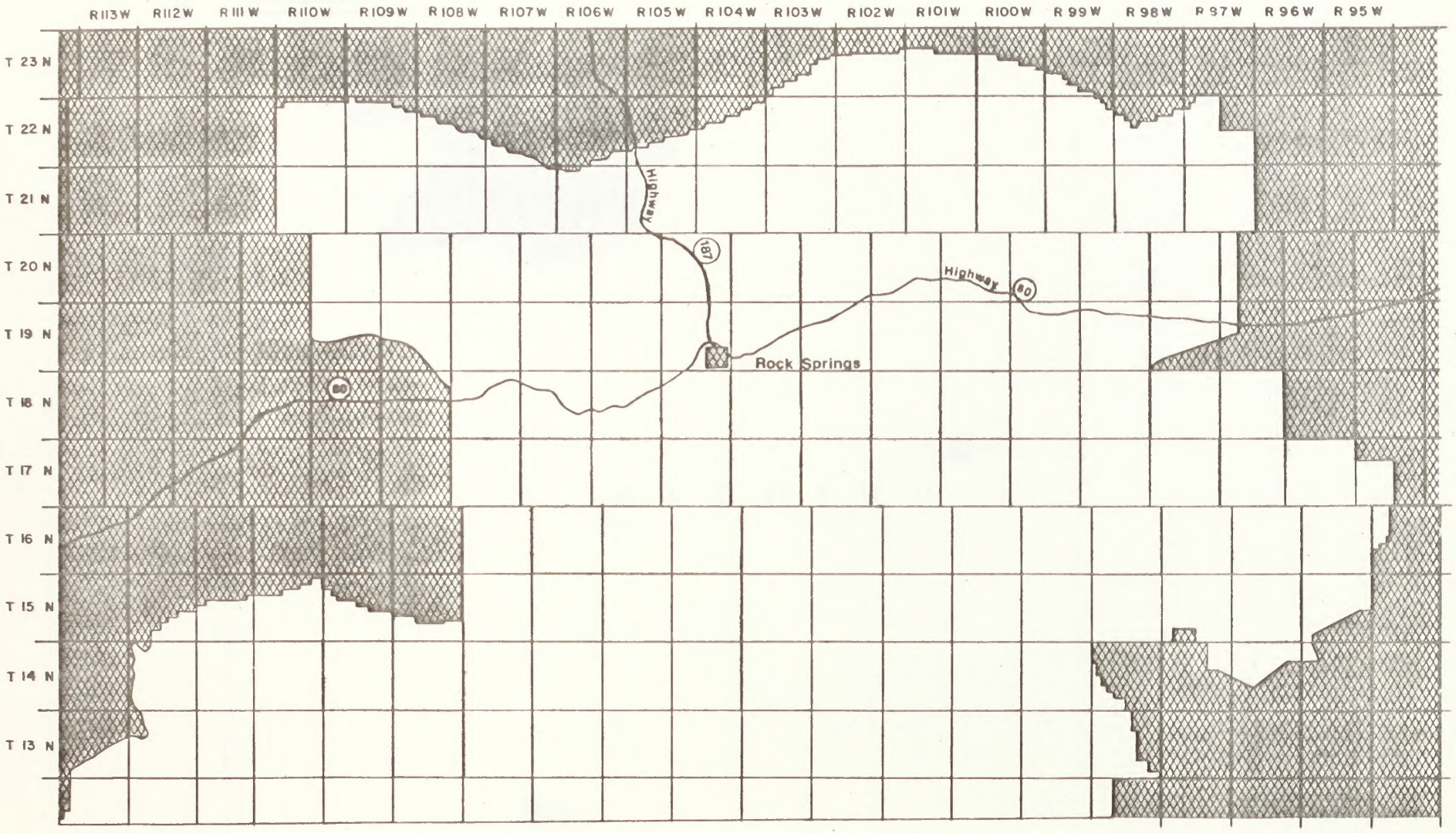


Figure 2 Map of study area with townships.

III. BIRDS, AMPHIBIANS AND REPTILES

3.1 METHODS

3.1.1 BIRDS

Bird inventory methods were developed following a literature search, meetings with BLM representatives, and modification of previously used field techniques summarized by Franzreb (1977).

3.1.1.1 Species Occurrence

We developed a preliminary species list (Appendix 1) based on studies by Oakleaf et al (1979) and distribution data from Bent (1961), Peterson (1961) and Robbins et al (1966). Unpublished data on file with the BLM were also reviewed.

In the field, the basic occurrence data were the species lists resulting from the bird transects. In addition, species not observed on the transects but seen in the immediate area and utilizing the particular habitat type being sampled were recorded in field notes.

3.1.1.2 Relative Abundance and Density Estimates

A single fixed-width strip transect was established in each sampling location (n = 70). Actual transect size varied depending upon the extent of available, relatively homogeneous habitat and the visibility laterally from the transect's center line. Transects in dense vegetation were, for example, significantly narrower than those in open, highly visible habitats. This technique was selected to offset the known effect of reduced detectibility as distance from the centerline increases.

Two techniques were used to set up the transects. The first consisted of a four man crew, three 50 m ropes, blue engineering flagging and a compass. Two center crew men would select a starting point so that the desired length and width could be achieved without overlapping other adjacent habitats. A compass bearing was taken from this starting point and recorded in a journal along with the date, time began and ended, size of transect, number of persons, and wildlife observations. One of the center crew men tied both 50 m (for 100 m width) ropes to belt loops on his waist while holding the third rope. Then, two crew men would stretch out the 50 m ropes at right angles and tie a blue flag on the vegetation in plain sight. The other center crew man stretched out the third 50 m rope in the direction of the compass bearing and tied a small blue flag on the vegetation. This technique was repeated outlining the perimeter of the desired transect size.

The second technique consisted of a three man crew, a rangefinder and a compass. A starting point was selected and a compass bearing was taken similar to that described in the first technique. Two crew men walked in opposite directions at right angles from the center crew man for approximately 50 m. The center crew man sighted in the rangefinder to 50 m and adjusted any corrections; then, a piece of visible blue flagging was tied on the vegetation. The center crew man walked approximately 50 m in the

direction of the compass bearing, sighted in the rangefinder to 50 m and adjust accordingly on the blue flagging at the starting point. This procedure was repeated for the desired transect size.

Each transect was sampled using techniques as generally outlined by Emlen (1977), Mikol et al (1979) and Franzreb (1977). All visual and audible cues were used to record all individuals by species as they were encountered while slowly walking along the centerline of the transect. Only those individuals within the pre-established boundaries of the strip transect were recorded.

Each transect was sampled on three consecutive mornings one-half hour before sunrise at a generally fixed pace of 100 meters requiring approximately one hour. The data were recorded on prepared data sheets (see example in Appendix 2) and included: (1) species, (2) number of individuals, (3) sex (if determined), (4) whether perched or flying, (5) whether seen or heard, (6) and the approximate distance of the individual(s) from the centerline (perpendicularly). Incidental habitat and descriptive data were also collected.

Two representative 35 mm color slides were taken of each transect. One mylar overlay was completed indicating the range of each observed species throughout the entire study area. Each transect center line and transect number was illustrated on 7.5 minute and 15 minute topographic maps. The slides, mylar overlay, and topographic maps are on file with the BLM in Rock Springs, Wyoming.

Quantitative analyses of the transect data were designed to develop relative density and abundance estimates to facilitate comparisons of the 16 habitat types sampled and/or the 3-6 transects sampled within each of the habitat types. To date, quantitative bird study designs have achieved very little standardization from one to the next. Therefore, the absolute density values derived are only marginally comparable with density estimates of other studies; however, relative differences between similar habitat types should be reasonably comparable and used with a greater degree of reliability than the absolute values themselves.

We selected a strip census technique whereby the number of individuals per species seen within the area effectively sampled is summed for each repetition. This value is then divided by the area of the strip census. Since several volumes were used in the 70 transects, these values were then standardized to present the data in terms of the number of individuals (per species) per hectare. The sum of all such species-specific density estimates within a single repetition equals D-total, or the total estimated number of individual birds per hectare.

3.1.1.3 Diversity Estimates

Ecologists have proposed several indices of dispersion in recent years. Most avian ecologists recognize diversity as representing not only species richness, but also the relative abundance of each species to the other. For example, a unit of area supporting ten species, each in equal densities is considered more diverse than the same unit of area with one "common"

species and nine "rare" species. To quantify this relationship, the following equation known as the Shannon-Weaver formula is applied:

$$\text{Diversity} = -\sum_{i=1}^{S} p_i \ln p_i$$

where p_i equals the proportion of the i-th species to the total population and s equals the total number of species. The maximum density value for any assemblage is defined as ln s; thus, diversity increases from zero to ln s as s increases and their proportions within the population becomes more equal (Shannon and Weaver, 1963; Hutcheson, 1970).

A Shannon-Weaver diversity index value was developed for the bird species assemblages and their estimate densitities within each of the 70 transects sampled.

We calculated a second diversity index based solely on species richness per area sampled. Values presented are the number of species per hectare.

3.1.1.4 Biomass Estimates

As an index of the relative biomass (of birds) supported within each of the sixteen habitats sampled, we calculated a minimum estimate based on the following approach. Representative weights for each species were obtained from the literature (Appendix 10). For each species recorded with an average density in the transects sampled per habitat type of greater than or equal to 0.1, the average density was multiplied by the weight value. These individual biomass estimates were then summed to yield a "minimum" estimated biomass index for each habitat type.

3.1.1.5 Owl Searches

Variations of field techniques described by Forsman (1976) were used to determine owl occurrence. These techniques included use of pre-recorded cassette tapes of owl calls, four-wheel drive vehicles, and a form for recording owl data (see Appendix 2).

Owl surveys were conducted between 14 May and 24 July 1980 at night on the bird transects and in the general vicinity of each transect by one and two man teams.

Day surveys were conducted to locate important use areas, i.e., nests and roosts. Two photographs of each important use area were taken with a 35 mm camera and labeled with the location and site number. Owl pellets were collected and analyzed to determine food habits using techniques described by Marti (1974). Prey species were identified to families and species by using Long (1936), Ingles (1973) and Borror et al. (1976).

3.1.2 AMPHIBIANS AND REPTILES

Methods and equipment used to locate, capture and identify amphibians and reptiles were based on techniques described by Stebbins (1966), Conant (1975) and Smith (1978). These methods included walking, night driving,

noosing, and seining. The equipment consisted of four-wheel drive vehicles, nooses, snake sticks, one seine, hip boots, cloth bags, and leak-proof containers.

Surveys began on 2 May and ended 6 September. Two-man teams randomly walked through the study area during peak activity periods using nooses, snake sticks and seines to capture amphibians and reptiles. Night driving on paved and unimproved roads was restricted to the southern part of the study area located south of Interstate 80. All species were identified in the field and released where they were captured.

Survey area boundaries were placed on topographic maps and identified with a site number. The site number consists of a single letter code "H" followed by a number corresponding to a specific location.

The 70 amphibian and reptile sites are equal to the 70 bird transects in terms of location and area surveyed, but they possess a different letter code. Appendix 3 identifies these equivalents.

Each habitat site was photographed with a 35 mm camera. Two representative color slides per site were taken and labeled with the location and site number.

3.1.2.1 Species Occurrence

Occurrence of amphibians and reptiles was developed from literature search, personal communication with state/federal agency personnel and others knowledgeable with the wildlife of Wyoming.

A species list (Appendix 4) was developed based on distributions and range maps by Stebbins (1966), Conant (1975) and Baxter and Stone (1980).

Animal species occurrence by habitat site forms, 6602-1 (Appendix 2) from IHICS were used to record the following data on amphibian and reptiles: date, area, location, physiographic region, association, special habitat features, biome, eco-region, status, relative abundance, general and specific use, and additional comments.

A mylar overlay map at scale 1"=2 miles was prepared indicating the species, location and site number of all amphibian or reptile observations in the study area. It is currently on file with the BLM in Rock Springs, Wyoming.

3.1.2.2 Relative Abundance

The abundance categories used were initially defined by Oakleaf et al (1979).

Final determination of abundance for each species was based on new field research and population status data as described by Baxter and Stone (1980).

The abundance categories are:

(1)	Rare	A species that occupies only a small percentage of the preferred habitat within its range or a species that is found throughout its range in extremely low densities; cannot always be found by a skilled observer even during intensive survey work.
(2)	Uncommon	A species that is common only in small areas within its range or a species that is found throughout its range in relatively low densities; usually requires intensive searching to be seen by a skilled observer.
(3)	Common	A species that inhabits much of the preferred habitat within its range; the species or its sign can usually be seen on any outing by a skilled observer during the proper season.
(4)	Undetermined	A species whose existence within the state is verified but not adequately documented. Data regarding population density or distribution are inadequate for assignment to one of the above categories.

3.2 RESULTS

3.2.1 HABITAT TYPES

3.2.1.1 Mixed Conifer

The mixed conifer habitat type consists primarily of three dominant tree species: Douglas Fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contortus*) and subalpine fir (*Abies lasiocarpa*). Other tree species occurring with these dominant species, but to a significantly lesser degree are: white fir (*Abies concolor*) and ponderosa pine (*Pinus ponderosa*).

Douglas fir mainly occur on steep slopes in scattered stands above 2735 meter elevation. Lodgepole pine and subalpine fir also occur in scattered stands above 2560 meter. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.1.1 Birds

Species Occurrence

Forty-seven bird species were found in mixed-conifer habitats. Thirty-eight species were found during transect sampling (Appendix 8). Nine additional species were recorded at these locations but not during transect sampling periods (Table 1).

Table 1. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-128	Golden eagle	Nest located
	Prairie falcon	Nest located
	Great Horned Owl	
T-310	Cooper's hawk	Nest located
	Poor-will	
	Common nighthawk	
	Mountain bluebird	Nest located
	Great Horned Owl	
T-36	Red-tailed hawk	
	Golden-crowned kinglet	
	Red crossbill	2+ individuals
	Chipping sparrow	

Three species were unique to this habitat type (Appendix 9): goshawk, saw-whet owl, and American redstart.

Five species were recorded in all five transect locations and represent a characteristic species assemblage: Clark's nutcracker, red-breasted nuthatch, yellow-rumped warbler, pine siskin, and gray-headed junco.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8a shows specific density estimates per transect in the mixed conifer habitat.

The most abundant species were gray-headed junco, pine siskin and mountain chickadee. This was the only habitat where goshawks were recorded.

3.2.1.1.2 Amphibians and Reptiles

Five mixed conifer habitats totaling 30 ha and requiring 10 man hours were searched for amphibians and reptiles from 7 June to 11 August, 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species were observed in mixed conifer habitat. The sample size and man-hours spent searching mixed conifer habitats is relatively small to determine if amphibians and reptiles occur in this habitat. According to reports by Stebbins (1966) and Conant (1975), most of the amphibians and reptiles occurring in southwestern Wyoming could

Table 2. Bird density estimates in sixteen habitat types. Values are given as birds per hectare.

	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush Greasewood	Basin Big Sagebrush	Big Sagebrush Grass	Highland Sagebrush Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrop	Dune
Mallard											•					
Pintail																•
Goshawk	•															
Accipiter sp.			•													
Red-tailed Hawk		•	•	•					•		•					
Ferruginous Hawk			•				•									
Golden Eagle		•		•										•		
Marsh Hawk					•	•					•	•				•
Prairie Falcon																•
Merlin										•						
American Kestrel		•	•	•	•		•		•	•			•		•	
Sage Grouse											•					
Killdeer					•						•	•			•	•
Mourning Dove	0.20	•	0.65	•	•	•	•	•	0.39	0.34	0.35	+	+	+	+	
Black-billed Cuckoo									•	•						
Great Horned Owl		•							•		•				•	
Long-eared Owl											•					
Saw-whet Owl	•															
Poor-will									•							
Common Nighthawk			•	•					•							
White-throated Swift	•								•							
Broad-tailed Hummingbird	•			•						0.21	0.16					
Common Flicker	•	+	•	•	•				0.16	0.78	0.40			•		
Yellow-bellied Sapsucker				•						•						
Hairy Woodpecker	•								+							
Eastern Kingbird									•	0.13						
Western Kingbird				•												
Cassin's Kingbird									•							
Ash-throated Flycatcher			•													
Say's Phoebe					•	+	•		•					•	+	
Hammond's Flycatcher	•								•							

Table 2
Continued

	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush Greasewood	Basin Big Sagebrush	Big Sagebrush Grass	Highland Sagebrush Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrop	Dune
Dusky Flycatcher				•					0.27	•						
Gray Flycatcher			0.37						•							
Western Flycatcher	•	•	•	•						•						
Empidonax sp.		•		•					0.21	0.41						
Western Wood Pewee	•		•						•	0.13	•					
Olive-sided Flycatcher	•	•							•							
Horned Lark		0.10		•	•	+	0.17	1.08	•			•	0.69	0.31	0.12	0.47
Violet-green Swallow	+	•	•	•	•	•	+		0.68	0.34	0.13	•	•	•	0.16	
Tree Swallow									•	+	•					
Rough-winged Swallow			•				•				•					
Barn Swallow	•						•				+					
Black-billed Magpie			•	•	•	0.97	•		•	•	0.24	+	•		+	
Pinyon Jay		0.29	0.13		•		•								0.13	
Clark's Nutcracker	0.30	0.21	•	•				0.52	+	•			0.36			
Black-capped Chickadee	0.21			•		•			•	0.18						
Mountain Chickadee	0.59			•					•							
Plain Titmouse			•													
Red-breasted Nuthatch	0.51	•							+							
Brown Creeper	0.11														•	
Dipper											•					
House Wren				+					0.86	1.80	0.13					
Bewick's Wren			0.37												•	
Rock Wren	•	0.40	•	+		•	•		•				•	0.14	0.32	
Sage Thrasher		•	•	•	0.16	0.27	+	•			0.91			•		
American Robin	0.23	0.10	+	0.18		•	•	+	1.28	1.69		+	+	•	+	
Hermit Thrush	0.31								•	•						
Mountain Bluebird	0.15	0.35	0.63	0.33	•	•	0.22	+	0.26	0.34	0.20		0.20	0.13	+	
Townsend's Solitaire	•								•							
Blue-gray Gnatcatcher			+													
Golden-crowned Kinglet		•														
Ruby-crowned Kinglet	0.17															

Table 2.
Continued

	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush Greasewood	Basin Big Sagebrush	Big Sagebrush Grass	Highland Sagebrush Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrop	Dune
Cedar Waxwing									•		•					
Loggerhead Shrike					0.10									•		
Starling			•						0.13	0.30	0.18	•				
Warbling Vireo	•			0.12					0.70	0.69	•					
Orange-crowned Warbler	•			•					•							
Virginia's Warbler				•												
Yellow Warbler				•					•	0.37	0.80					
Yellow-rumped Warbler	0.25								0.16							
Black-throated Gray Warbler		•	0.15													
MacGillivray's Warbler	•			0.62					0.12	0.48	0.49				•	
Yellow-breasted Chat											•					
Wilson's Warbler	•														•	
American Redstart	•															
Western Meadowlark							•					0.12				
Yellow-headed Blackbird												•				
Red-winged Blackbird												0.32				
Brewer's Blackbird			•	+	•	0.13	•		0.11	0.59	1.02	0.56	0.26		•	•
Brown-headed Cowbird			•	•	•	•			0.16	0.18	0.16				•	
Western Tanager	•	•	•						•			•				
Rose-breasted Grosbeak												•				
Black-headed Grosbeak				•												
Lazuli Bunting												•				
Purple Finch	•								0.22	0.54						
Cassin's Finch	0.13			•												
House Finch		•	0.30													
Pine Siskin	0.70								•	•						
Lesser Goldfinch										•						
Green-tailed Towhee	0.13	0.19	•	1.04	•	0.73	0.13		0.31	0.45	0.38			+	•	
Lark Bunting			•													
Savannah Sparrow												0.11				

Table 2.
Continued

	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush Greasewood	Basin Big Sagebrush	Big Sagebrush Grass	Highland Sagebrush Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrop	Dune
Vesper Sparrow				•			+				•	•	+		•	+
Lark Sparrow							•									
Sage Sparrow			•	•	•	0.18	0.43							+	+	•
Gray-headed Junco	0.95			•					0.63							
Chipping Sparrow	•	•	0.35	0.11	•					•					+	
Brewer's Sparrow			0.12	0.61	•	2.19	0.49		•	•	0.16	•		+		
White-crowned Sparrow	•			•					+	0.58	0.60					
Fox Sparrow										•	0.76					
Lincoln's Sparrow					•											
Song Sparrow				•	•	0.16	0.14		•	2.43	1.51	+				
Total Density	4.75	1.64	3.07	3.01	0.26	4.63	1.58	1.60	6.65	12.96	8.58	1.11	1.51	0.58	0.73	0.47

• = Bird observed on one or more transects but average density less than 0.1; plus bird seen on less than 50% of the transects.

+ = Occurs at low density (less than 0.1); plus seen on 50% or more of the transects.

be in forested habitat at elevations above 3600 meters. In the study area, mixed conifer habitat occurs from approximately 2316 to 2895 meters elevation; therefore, if the microhabitat requirements were adequate a few amphibians and reptiles could be found at these higher elevations. Adverse weather at the higher altitudes, resulting in unsafe road conditions and cold temperatures, resulting in a late snow melt were the main factors for not sampling more mixed conifer habitats in the study area.

3.2.1.2 Limber Pine

Limber pine (*Pinus flexilis*) is the dominant tree species of this habitat. Two subdominant species that comprise the understory are juniper (*Juniperus* sp.) and sagebrush (*Artemisia* sp.).

Limber pine occurs on ridgetops and steep slopes in sparse stands above 2195 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.2.1 Birds

Species Occurrence

Twenty-nine bird species were found in limber pine habitats. Appendix 8b lists 24 species found during transect sampling (n = 4 sites). Five additional species were recorded at these locations but not during the transect sampling periods (Table 3).

No species were unique to this habitat type (Appendix 9).

Species composition in the four limber pine habitats varied noticeably. Only two species were found at all sites. Seventeen of 29 species were seen at only one of the four sites.

Table 3. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-126	Red-tailed hawk	
	Prairie falcon	Nest located
	American kestrel	
T-57	Ferruginous hawk	Pair of adults
	Prairie falcon	Two nests located
	Poor-will	
	Red crossbill	15-20 individuals
T-114	Pinyon jay	
T-72	Gray catbird	

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8b shows specific density estimates per transect in the limber pine habitat.

The most abundant species in limber pine were mountain bluebird, rock wren, violet-green swallow and Clark's nutcracker.

3.2.1.2.2 Amphibians and Reptiles

Four limber pine habitats totaling 30 ha and requiring 19 man-hours were searched for amphibians and reptiles from 10 May to 18 June 1980.

Species Occurrence and Relative Abundance

One reptile species, the northern sagebrush lizard (*Sceloporus graciosus graciosus*), was observed at site H-55. Male and female adults were observed in courtship behavior on rocky substrate surrounded by sparse limber pine and juniper woodland at 2219 meters elevation. No amphibians or reptiles were observed in the other three limber pine habitats sampled.

Northern sagebrush lizards were common throughout site H-55, but did not occur at the other three limber pine sites. Baxter and Stone (1980) reports that this species prefers rocky outcrops in sagebrush communities and site H-55 fits this description.

Due to the small sample size and limited results, the importance of limber pine habitat for amphibians and reptiles can only be applied to localized areas where known populations exist.

3.2.1.3 Juniper

Juniper (Juniperus sp.) is dominant with sagebrush and mountain shrub (Cercocarpus sp.) occurring as the dominant understory species. Outcrops of rock boulders are commonly found throughout most of the habitat. In addition, juniper is widely distributed throughout the entire study area above 1950 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.3.1 Birds

Species Occurrence

Thirty-seven bird species were found in juniper habitats. Appendix 8c lists 34 species found during transect sampling (n = 5 sites). Three additional species were recorded at these locations but not during the transect sampling periods (Table 4).

Five species were unique to this habitat type (Appendix 9): ash-throated flycatcher, plain titmouse, blue-gray gnatcatcher, Scott's oriole, and lark bunting.

Only nine species were found along T-302 whereas T-77 and T-14 had 21 and 22 species, respectively. Five species occurred in all five transects:

Table 4. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-20a	Pinyon jay	
	Great Horned Owl	Roost
T-302	Red-tailed hawk	Nest located
	Common flicker	
	Ruby-crowned kinglet	
	Scott's oriole	Male
	Green-tailed towhee	
	Great Horned Owl	Roost
T-52	Red-tailed hawk	
	Pinyon jay	2+ individuals
	Great Horned Owl	
T-77	Great Horned Owl	Roost

mourning dove, gray flycatcher, Bewick's wren, mountain bluebird, and chipping sparrow.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8c shows specific density estimates per transect in the juniper habitat type.

The most abundant species were mourning doves, mountain bluebirds, gray flycatchers and chipping sparrows. Bewick's wren, a species of high interest in Wyoming, was recorded in all five juniper transects.

3.2.1.3.2 Amphibians and Reptiles

Sixteen juniper habitats totaling 162 ha and requiring 60.5 man hours were searched for amphibians and reptiles from 5 May to 4 September, 1980.

Species Occurrence and Relative Abundance

Six reptile species (Table 5) were located in twelve of the sixteen juniper habitat sites ranging in elevation from 2010-2225 meters.

Surveys conducted on juniper habitat totaled 12.7% (162.4 ha) of the total surveyed area. Locations of reptiles occurred in 43.8% of the total juniper sites. The Firehole Basin sites comprised 53.8% of the total sites where reptiles were located.

Table 5. Site locations of six reptile species at twelve juniper habitats.

Species	Juniper Sites											
	H-1	H-2	H-3	H-4	H-8	H-15	H-17	H-44	H-46	H-49	H-56	H-59
Northern Plateau Lizard				X		X	X			X		
Northern Sagebrush Lizard	X	X	X		X	X	X	X	X	X	X	
Tree Lizard										X		
Eastern Short-horned Lizard						X				X		
Great Basin Gopher Snake										X		
Midget Faded Rattle-snake												X

Tree lizards were observed at site H-49 in crevices and nooks in a rocky canyon with juniper comprising the dominant vegetation. Also, the greatest number of species occurred at site H-49.

The northern plateau lizard and northern sagebrush lizard were observed occupying the same area. However, the plateau lizard was observed less often and seemed to prefer large boulder outcrop areas. The sagebrush lizard occupied more of a variety of sites including vegetated niches under shrubs and rocks. The sagebrush lizard was, by far, the most numerous reptile species.

The eastern short-horned lizard's distribution varies considerably. Only one of this species was observed at sites H-15 and H-49. It was seen associated with ant colonies both times.

The molted skin of a great basin gopher snake was located at site H-49, indicating a possible densite nearby.

One adult male midget faded rattlesnake (*Crotalus viridis concolor*) was observed crossing Highway 373 during night driving on 1 August, 1980.

Only reptiles were located in juniper habitat. None of the areas contained ponds or ephemeral pools or streams where amphibians could be found. Only

one site (H-52) contained two seeps. However, no reptiles or amphibians were observed at this location. All of the juniper habitat surveyed was, to some extent, comprised of a rocky stratum.

The Firehole Basin appeared to be the most diverse area in terms of species occurrence for amphibians and reptiles. A remnant population of the great basin spadefoot also occurred in the Firehole Basin; this was in saltbush-greasewood habitat.

Midget faded rattlesnakes only occurred in the Firehole Basin, but in three distinct habitats: juniper (H-59), saltbush-greasewood (H-10); and big sagebrush-grass (H-11).

Tree lizards occurred only in the Firehole Basin at sites H-5 and H-49. Both sites contain typical niches for this species. Baxter and Stone (1980) report that this species has been located only in the extreme southwestern portion of Wyoming on the west side of the Green River close to the Utah border. Therefore, the present sightings of this lizard indicate a probable range extension.

3.2.1.4 Mountain Shrub

This habitat consists of pure or mixed stands of mountain mahagony, serviceberry (Amelanchier sp.), antelope bitter brush (Purshia tridentata) or chokecherry (Prunus sp.). Other vegetation associated with this type include snowberry (Symphoricarpos sp.), sagebrush, or juniper. Mountain shrubs are occasionally found on steep slopes in sparse scattered stands above 2347 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.4.1 Birds

Species Occurrence

Forty bird species were found in mountain shrub habitats (Appendix 8d). All of these were recorded at least once during a transect sampling. Table 6 lists additional species found within individual transects but none were additional to the overall species occurrence total.

Three species were unique to this habitat type (Appendix 9): western kingbird, Virginia's warbler, black-headed grosbeak.

Only the green-tailed towhee was common to all six transects. Twenty-one species were found in only one of the six transects. This high degree of

Table 6. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-4	*Empidonax* sp.	
	Chipping sparrow	
T-336	Song sparrow	
T-341	American kestrel	
	Common flicker	
	Clark's nutcracker	Many small groups

species variation indicates that local conditions or ecotone associations may contribute significantly to the species assemblage in each case.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8d shows specific density estimates per transect in the mountain shrub habitat.

The most abundant species recorded were green-tailed towhee, MacGillivray's warbler, Brewer's sparrow and mountain bluebird.

3.2.1.4.2 Amphibians and Reptiles

Six mountain shrub habitats totaling 37 ha and requiring 15 man hours were searched for amphibians and reptiles from 19 June to 3 August, 1980.

Species Occurrence and Relative Abundance

One amphibian species, the Utah tiger salamander (*Ambystoma tigrinum utahensis*) was observed at site H-48. This site's microhabitat, a perennial pond referred to as Box Spring Reservoir was bordered on one side by serviceberry-sagebrush vegetation at 2359 m elevation. Numerous adults and small larvae were observed as well as two-year-old larvae transforming into adults. The average size of 27 adults was 21.6 centimeters.

3.2.1.5 Saltbush - Greasewood

Saltbush (*Atriplex nuttallii*) and greasewood (*Sarcobatus vermiculatus*) co-dominate this type. Saltbush occurs predominantly in upland areas while greasewood dominates the lowlands. Other vegetation associated with this type is winterfat (*Eurotia lanata*) and bud sagewort (*Artemisia spinescens*).

Saltbush-greasewood is commonly found on flat alluvial fans in canyons and flood plains adjacent to intermittent and perennial streams above 1981 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.5.1 Birds

Species Occurrence

Twenty-nine bird species were found in saltbush-greasewood habitats. Appendix 8e lists 21 species found during transect sampling (n = 6 sites). Eight additional species were recorded at these locations but not during the transect sampling periods (Table 7).

One species was unique to this habitat type (Appendix 9): Lincoln's sparrow.

Table 7. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-301a	Golden eagle	2 adults together
	Say's phoebe	
	Mountain bluebird	
	Great Horned Owl	
T-122	Clark's nutcracker	
	Rock wren	
	Great Horned Owl	Roost
T-58a	Prairie falcon	2 adults together
T-331	Western meadowlark	
T-90	American kestrel	
	Barn swallow	
	Starling	
T-339	Killdeer	
	Rock wren	

Only Brewer's sparrows were found at all six transect locations. Sage thrashers were also a representative species in these areas.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8e shows specific density estimates per transect in the mountain shrub habitat.

The most abundant species recorded were Brewer's sparrow, sage sparrow and sage thrasher.

3.2.1.5.2 Amphibians and Reptiles

Fifteen saltbush-greasewood habitats totaling 171 ha and requiring 60 man hours were searched for amphibians and reptiles from 6 May to 3 September, 1980.

Species Occurrence and Relative Abundance

Two amphibian and three reptile species were located in ten of the fifteen saltbush-greasewood habitat sites ranging in elevation from 1940-2165 meters (Table 8).

Table 8. Site locations of five amphibian and reptile species at ten saltbush-greasewood habitats on the Salt Wells resource area of Rock Springs, Wyoming. (May-September 1980).

Species	Saltbush-Greasewood Sites									
	H7	H10	H22	H33	H35	H36	H37	H42	H52	H60
Utah Tiger Salamander					X	X[1/]	X[1/]			
Great Basin Spadefoot	X									
Eastern short-horned Lizard			X							X
Wandering Garter Snake				X				X	X	
Midget Faded Rattlesnake		X								

[1/] larvae found also at this location but unidentified subspecies.

Each site only yielded one species; and two sites, H-7 and H-52, occurred in areas where bird transects T-301a and T-90, respectively, were located. One site (H-60) occurred in the same area as prairie dog colony site S-1. Aquatic sites H-35, H-36 and H-47, located adjacent to the Jim Bridger Power Plant, contained tiger salamander larvae. Utah tiger salamanders were identified at site H-35, but the subspecies was not determined at sites H-36 and H-37.

Three great basin spadefoot adult males and this year's egg clusters were located in a small pool fed by an intermittent stream adjacent to H-7.

A four mile stretch of the stream was surveyed, but only a few more pools contained egg clusters.

Site H-22, located adjacent to Fifteen Mile Knoll Reservoir, produced one eastern short-horned lizard young of this year. This man-made reservoir appears highly silted and is heavily used by cattle and waterfowl.

Two wandering garter snakes, located at sites H-33 and H-52, were associated with old ruins adjacent to perennial streams. Chorus frogs (*Pseudacris triseriata*) have been reported in the area around site H-33, but none were observed (pers. comm.; Jim Dunder BLM). A molted skin from a midget faded rattlesnake was located under a small bridge over Sage Creek. The bank under the bridge is eroded and contains numerous cavities. This location may have been a denning site.

Amphibians located in saltbush-greasewood habitats, only occurred there if adequate breeding habitat was present, i.e., ponds or pools fed by perennial or intermittent streams or spring. The heavily silted ponds surveyed

contained no amphibians. Ponds or pools that were clear and contained aquatic vegetation (i.e., coontail (Cerratophyllum sp.), Juncus sp., forms of algae and food sources) usually contained amphibians.

A dense population of tiger salamanders occur at sites H-35, H-36 and H-37. Initially, these sites were known to contain tiger salamanders (pers. comm.; Dick Randall).

The remnant spadefoot population at site H-7 is characteristic for this dry area in Firehole Basin where there is a paucity of adequate breeding habitat.

Old ruins probably provide adequate cover and some foraging habitat for wandering garter snakes. Two were found crawling in and around the ruins at sites H-33 and H-52.

3.2.1.6 Basin Big Sagebrush

Basin big sagebrush (Artemisia tridentata tridentata) is dominant in the lowlands usually adjacent to intermittent streams. Big sagebrush (Artemisia tridentata vaseyana) is always associated with this type. Basin big sagebrush is characteristically (1.5-2.7 m high) found in washes and basins above 1825 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.6.1 Birds

Species Occurrence

Twenty bird species were found in basin big sagebrush habitats. Appendix 8f lists 17 species found during transect sampling (n = 3 sites). Three additional species were recorded at these locations but not during the transect sampling periods (Table 9.)

No species were unique to this habitat type (Appendix 9).

Green-tailed towhees and Brewer's sparrows were recorded along all three transects. In general, this habitat type has low species richness.

Table 9. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-112	Ferruginous hawk	2 adults together
T-303	*Empidonax* sp.	
T-33	Marsh hawk Sage grouse	One adult male

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8f shows specific density estimates per transect in the basin big sagebrush habitat.

The most abundant species were Brewer's sparrow, black-billed magpie, green-tailed towhee and sage thrasher.

3.2.1.6.2 Amphibians and Reptiles

Three basin big sagebrush habitats totaling 15 ha and requiring 6.3 man hours were searched for amphibians and reptiles from 10 May to 22 June, 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species were observed in basin big sagebrush habitat.

The sample size and number of man hours spent surveying this habitat is relatively small to absolutely determine if amphibians and reptiles occupy basin big sagebrush on the study area.

Since most of this habitat occurs in drainages and washes, we suspect some amphibian populations are present, provided that adequate breeding habitat and conditions are present. Site H-70 fits this criteria. However, a survey should be conducted in early May when rainfall in the area is at its peak.

3.2.1.7 Big Sagebrush-grass

Big sagebrush characteristically (less than 1.2 meters in height), is widely distributed and occurs throughout all of the study area above 1829 meters elevation. Other associated plant species are shadscale (*Atriplex confertifolia*, horsebrush (*Tetrademia* sp.), saltbush, greasewood, basin big sagebrush, juniper, mountain shrubs, willows, (*Salix* sp.), cottonwood (*Populus* sp.), limber pine, wheatgrass (*Agropyron* sp.), wild rye (*Elymus* sp.), needlegrass (*Stipa* sp.) bluegrass (*Poa* sp.), dropseed (*Sporobolus* sp.), and numerous forbs. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.7.1 Birds

Species Occurrence

Twenty-nine bird species were found in big sagebrush-grass habitats. Appendix 8g lists 22 species found during transect sampling (n = 5 sites). Seven additional species were recorded at these locations but not during the transect sampling periods (Table 10).

Three species were unique to this habitat type (Appendix 9): ring-necked pheasant, lark sparrow, McCown's longspur.

Table 10. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-300	Say's phoebe	
	Mountain bluebird	
	McCown's longspur	
T-118	Golden eagle	nest located
	Common flicker	
T-119	Brewer's blackbird	
	Chipping sparrow	
T-59	Ferruginous hawk	
	Ring-necked pheasant	female with 2 young
T-332	Say's phoebe	
	Violet-green swallow	
	Wilson's warbler	
	Lazuli bunting	

Green-tailed towhees and Brewer's sparrows were recorded along all five transects. This is the same as for the basin big sagebrush habitats; however, big sagebrush-grass supports a somewhat greater number of species than does basin big sagebrush.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8g shows specific density estimates per transect in the big sagebrush-grass habitat.

The most abundant species were Brewer's sparrow, sage sparrow and mountain bluebird.

3.2.1.7.2 Amphibians and Reptiles

Fifteen big sagebrush-grass habitats totaling 123.6 ha and requiring 65.3 man hours were searched for amphibians and reptiles from 5 May to 26 August, 1980.

Species Occurrence and Relative Abundance

Two amphibian species and five reptile species were located in ten of the fifteen big sagebrush-grass habitat sites ranging in elevation from 1980-2469 meters (Table 11).

Table 11. Site locations of seven amphibian and reptile species at ten big sagebrush-grass habitats.

Species	Big Sagebrush-grass Sites									
	H-6	H-11	H-28	H-29	H-47	H-50	H-57	H-58	H-61	H-62
Utah Tiger Salamander					X					
Northern Leopard Frog			X	X						
Northern Plateau Lizard		X								
Northern Sagebrush Lizard		X								
Eastern short-horned Lizard						X			X	X
Great Basin Gopher Snake	X	X					X	X		
Midget Faded Rattlesnake		X								

Two sites, H-60 and H-50 occurred in areas where bird transects T-300 and T-332, respectively, were located. Also, sites H-61 and H-62 occurred in the same area as prairie dog colony sites S-1 and S-27, respectively.

Nine of ten sites only yielded one species. However, site H-11, the most diverse site, yielded four species. Sites H-6, H-11, H-57 and H-58 were located in the Firehole Basin. The other sites were widely distributed throughout the study area.

Two perennial ponds are associated with site H-47, where adult Utah tiger salamanders, one year old larvae, and this year's larvae were identified.

The smaller pond, not located on any maps, is approximately 300 m southeast of the larger pond. Both ponds are characteristic of adequate breeding habitat for amphibians.

Four great basin gopher snakes locations were restricted to the Firehole Basin. One molted skin was found at site H-11. At the other three sites, gopher snakes were observed crossing roads: site H-6 on Little Firehole road, site H-57 on Highway 373, and site H-58 on Sage Creek Road.

The most diverse site (H-11) is a rocky bluff above Sage Creek. Greasewood is more dominant at this site than at other big sagebrush habitats. Two adult molted skins from great basin gopher snakes were found. Also, we found an adult midget faded rattlesnake skin. No live gopher snakes were observed. However, a return trip at night revealed a female midget faded rattlesnake 38.1 cm in length just north of the rocky bluff. Breeding

populations of the northern sagebrush lizard and the northern plateau lizard also were observed at this site. Both adults and young are common throughout the entire site.

Sagebrush and plateau lizards were the only two reptile species that occurred in significant numbers in big sagebrush-grass. The other reptile species were isolated sightings and widely distributed, except for the gopher snakes, which all occurred in the Firehole Basin. The Firehole Basin appeared to be the most diverse area in terms of species occurrence and number of species for reptiles.

Leopard frog occurrence at sites H-28 and H-29 was solely restricted to the Red Creek area at elevations over 2438 m, however, a small population was observed in the same area 4.8 km to the north in riparian forest habitat at an elevation of 2410 meters.

3.2.1.8 Highland Sagebrush-grass

Big sagebrush (*Artemisia* sp.) and black sagebrush (*Artemisia nova*) are the dominant plant species of this type. Other plant associations include grasses and some forbs. This habitat occurs on ridge and mountain tops above 2347 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.8.1 Birds

Species Occurrence

Eight bird species were found in highland sagebrush-grass habitats. Appendix 8h lists six species found during transect sampling (n = 4 sites). Two additional species were recorded at these locations but not during the transect sampling periods (Table 12).

No species were unique to this habitat type (Appendix 9). Horned lark was the only species found on all four transects. This habitat had the lowest number of species present of all 16 types sampled.

Table 12. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-85a	Sage grouse	one female
T-306	American kestrel	2 adults together
	Clark's nutcracker	20+ individuals

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8h shows specific density estimates per transect in the highland sagebrush-grass habitat.

The most abundant species were horned larks and Clark's nutcrackers. American robins were recorded but in low numbers in three of four transects.

3.2.1.8.2 Amphibians and Reptiles

Four highland sagebrush-grass habitats totaling 40 ha and requiring 10 man hours were searched for amphibians and reptiles from 2 June to 22 July, 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species were observed in highland sagebrush-grass habitat.

The sample size and man hours recorded in search of amphibians and reptiles in highland sagebrush-grass habitat may be too small to determine occurrence. No ponds or man made reservoirs were associated with this habitat at the four sites. Other sites that were not surveyed could possess the potential to support leopard frogs or tiger salamanders, if there was adequate breeding habitat.

Reptiles, according to Stebbins (1966), can be found in relatively high elevations in sagebrush communities; however, none were observed. Common prolonged cold temperatures at elevations over 2345 meters may be one of the major limiting factors for the absence of reptiles.

3.2.1.9 Aspen

Quaking aspen (Populus tremuloides) occurs in dense scattered stands on steep slopes above 2316 meters. Many aspen stands are associated with riparian vegetation and often occur adjacent to perennial streams (Section 3.16). All sampled stands, however, were dry and not associated with riparian or wet areas. Other plant associations include willow, mountain shrubs, serviceberry, big sagebrush, black sagebrush, and snowberry. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.9.1 Birds

Species Occurrence

Fifty-two bird species were found in aspen habitats (Appendix 9). This is the largest number of species for any of the 16 habitats sampled. Also, T-111 had the most species of any single transect. Appendix 8i lists fifty species found during transect sampling (n = 6 sites). Two additional species were recorded at these locations but not during the transect sampling periods (Table 13).

Two species were unique to this habitat type (Appendix 9): Cassin's kingbird and dark-eyed junco.

Table 13. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-316	Cooper's hawk	one individual
	Great horned owl	
T-111	Yellow-rumped warbler	
	Dark-eyed junco	
T-371	Green-tailed towhee	
	Great horned owl	nest located
T-6	Red-tailed hawk	
	Clark's nutcracker	20+ individuals
T-35	House wren	
T-335	Brewer's blackbird	adults with young
	Great horned owl	roost

Three species were found in all six transects: common flicker, American robin, and warbling vireo. The number of species per transect was relatively consistent at 17-25; three transects had 17 and one had 16 species.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8i shows specific density estimates per transect in the aspen habitat type.

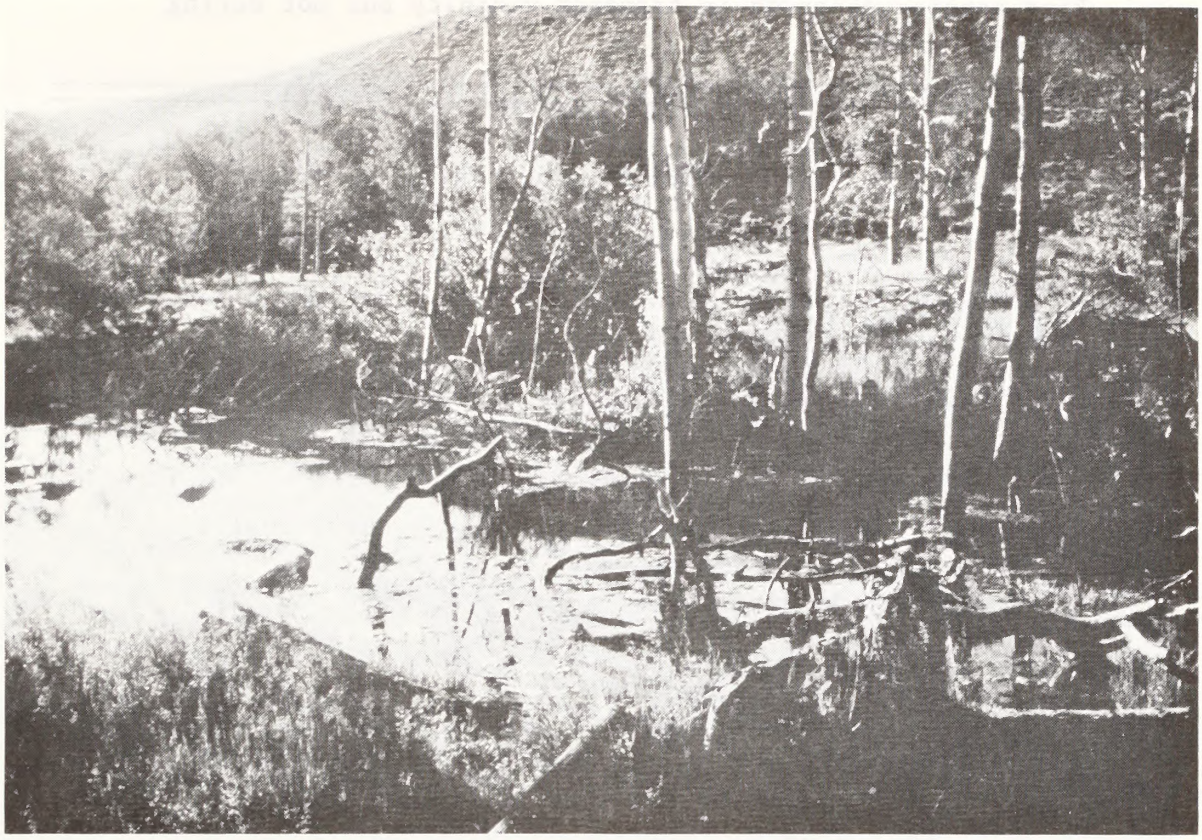
The most abundant species were American robin, house wren, warbling vireo and violet-green swallow.

3.2.1.9.2 Amphibians and Reptiles

Six aspen habitats totaling 32 ha and requiring 26.5 man hours were searched for amphibians and reptiles from 19 May-7 July, 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species was observed in aspen habitat. The aspen habitats surveyed consisted of mature and young stands and were not associated with riparian habitat. Riparian habitat with aspen as the dominant species is categorized as a distinct habitat termed riparian forest.



3.2.1.10 Riparian Forest

Riparian forest comprises two distinct dominate habitats: (1) aspen and (2) cottonwood. Both habitats occur adjacent to perennial streams in association with riparian vegetation that includes willow and some serviceberry. Aspen normally occurs on steep slopes and in valleys above 2316 meters. Cottonwood habitat is very limiting and rarely exists throughout the study area. One area that has been surveyed (T-321a) is approximately 2225 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.10.1 Birds

Species Occurrence

Forty-four bird species were found at riparian forest habitat sampling sites (n = 4). Figure 3 (see Section 3.3.1.1) depicts only 41, however, three duck species are included that were utilizing a small lake adjacent to the riparian forest being sampled at T-329. Their use of the riparian forest is considered very minimal, if at all.

Appendix 8j lists 36 species found during transect sampling. An additional five species (minus three duck species) were recorded at these locations but not during the transect sampling periods (Table 14).

Five species were unique to this habitat type (Appendix 9): gadwall, ringnecked duck, turkey vulture, merlin, lesser goldfinch.

Table 14. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-329	Mallard[1/]	at small lake nearby
	Gadwall[1/]	at small lake nearby
	Ring-necked duck[1/]	at small lake nearby
	Red-tailed hawk	active nest found
	Merlin	one adult
	Mountain bluebird	
	Red-winged blackbird	at small lake nearby
	Great horned owl	
T-309a	Turkey vulture	four adults
	Red-tailed hawk	
	American kestrel	
	Great horned owl	
T-321a	Rock wren	
	White-crowned sparrow	

[1/]not included in species total (see text).

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8j shows specific density estimates per transect in the riparian forest habitat.

The most abundant species were song sparrow, house wren and American robin.

3.2.1.10.2 Amphibians and Reptiles

Five riparian forest habitats totaling 18 ha and requiring 28 man hours were searched for amphibians and reptiles from 20 June to 13 August, 1980.

Species Occurrence and Relative Abundance

Northern leopard frogs were located at site H-31 in an active beaver pond at 2410 meters. Fourteen adults were counted, however, no young were observed.

Site H-31, located approximately 2.4 km from sites H-28 and H-29 where additional leopard frog populations exist, is the only area where this species was found.

No reptiles were observed; however, wandering garter snake are considered common and should occur in most habitats except for alpine areas up to 3048 meters in Wyoming (Baxter and Stone 1980).

3.2.1.11 Riparian Shrub

Riparian shrub habitat is sparse and scattered at elevations slightly above 2225 meters. Dominant plants are willow and serviceberry including associations of gooseberry (Ribes sp.), rose (Rosa sp.) and chockecherry. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.11.1 Birds

Species Occurrence

Thirty-nine bird species were found at riparian shrub sampling sites (n = 3). Appendix 8k lists 34 species found during transect sampling. Five additional species were recorded at these locations but not during the transect sampling periods (Table 15).

Five species were unique to this habitat type (Appendix 9): green-winged teal, solitary sandpiper, long-eared owl, dipper, yellow-breasted chat. Common flickers, American robins, mountain bluebirds and Brewer's blackbirds were found in each of the three sampling locations.

Table 15. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-312	Mallard	
	Green-winged teal	female
	Solitary sandpiper	
	Mourning dove	
	Poor-will	
	Black-capped chickadee	
	Warbling vireo	
	Chipping sparrow	

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8k shows specific density estimates per transect in the riparian shrub habitat.

The most abundant species were song sparrow, Brewer's blackbird, American robin and yellow warbler.

3.2.1.11.2 Amphibians and Reptiles

Three riparian shrub habitats totaling 12 ha and requiring 10.5 man hours were searched for amphibians and reptiles from 22 June to 12 August, 1980.

Species Occurrence and Relative Abundance

One site (H-12) yielded one juvenile wandering garter snake (23 cm in length) adjacent to a stream at 2240 meters of elevation. Abandoned beaver ponds were present, however, no amphibians or other reptiles were observed.

The small sample size and number of man hours were minimal to determine species occurrence of amphibians and reptiles. One wandering garter snake, the most common reptile in Wyoming according to Baxter and Stone (1980), was located at this site.

3.2.1.12 Riparian Meadow

The dominant plant species of this habitat are rushes (Juncus sp.) and sedges (Carex sp.). This habitat is sparse throughout the study area and occurs above 2042 meters elevation. Other plant associations include big sagebrush, wildrye, and some forbs. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.12.1 Birds

Species Occurrence

Twenty-three bird species were found at riparian meadow sampling sites (n=3). Appendix 81 lists 19 species found during transect sampling. Four additional species were recorded at these locations but not during transect sampling periods (Table 16).

Four species were unique to this habitat type (Appendix 9): cliff swallow, yellow-headed blackbird, rose-breasted grosbeak, savannah sparrow.

Mourning doves and red-winged blackbirds were seen at all three locations. Mourning doves were not recorded during the sampling replicates at T-86a.

Table 16. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-92	Mallard	female
T-86a	Marsh hawk	adult male
	Mourning dove	
	Horned lark	
	Cliff swallow	
T-308a	Golden eagle	
	White-crowned sparrow	

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 81 shows specific density estimates per transect in the riparian meadow habitat.

The most abundant species were Brewer's blackbird, red-winged blackbird and western meadowlark.

3.2.1.12.2 Amphibians and Reptiles

Five riparian meadow habitats totaling 50 ha and requiring 13.5 man hours were searched for amphibians and reptiles from 31 May to 14 August 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species were observed in riparian meadow habitat. The most common species to occur in riparian meadow habitat in Wyoming according to numerous reports by Baxter and Stone (1980) is the wandering garter snake; however, this snake was not observed at any of the five sites.

An average of 2.7 man hours per site were spent searching, which evidently is not enough time to determine occurrence.

3.2.1.13 Mountain Meadow

This habitat primarily consists of short grasses and forbs in association with low growing sagebrushes. Mountain meadows occur on mountain tops above 2500 meters elevation. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.13.1 Birds

Species Occurrence

Eleven bird species were found at mountain meadow habitat sites (n=4) (Appendix 8m).

No species were unique to this habitat type (Appendix 9). It had the second lowest number of species present, next to highland sagebrush-grass (n=8).

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8m shows specific density estimates per transect in the mountain meadow habitat.

The most abundant species were horned lark, Clark's nutcracker and mountain bluebird.

3.2.1.13.2 Amphibians and Reptiles

Four mountain meadow habitats totaling 40 ha and requiring 8 man-hours were searched for amphibians and reptiles from 5 July to 22 July 22 1980.

Species Occurrence and Relative Abundance

No amphibian or reptile species were observed in mountain meadow habitat. Mountain meadow habitat is primarily limited to the higher elevation areas such as: Red Creek Ranch, Lone Tree, and Currant Creek Ranch. Site H91 was at the lowest elevation of 2514 meters whereas, the other three sites H-83, H-89, and H-101 occurred at elevations of 2713 m, 2896 m and 2658 m, respectively.

Amphibians found at this elevation would only occur where breeding habitat was available, but no ponds or pools were located at these sites. Reptiles may occur, but none were observed over 2255 meters elevation, even though adequate habitat was occasionally available.

3.2.1.14 Badlands

This habitat type characteristically lacks vegetation, however, sparse plant associations include big sagebrush, greasewood, saltbush, primrose (Oenothera sp.), forbs and short grasses. Badlands are widely scattered and always occur as rolling to hilly uplands with complex slopes at elevations above 1920 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.14.1 Birds

Species Occurrence

Eighteen bird species were found at badlands sampling sites (n = 4). Appendix 8n lists 14 species found during transect sampling. Four additional species were recorded at these locations but not during transect sampling periods (Table 17).

No species were unique to this habitat type (Appendix 9). Only mountain bluebirds were present at all four sampling locations.

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8n shows specific density estimates per transect in the badlands habitat.

Table 17. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-304	Golden eagle Prairie falcon Sage grouse Common nighthawk	active nest located
T-55a	Ferruginous hawk	2 adults together

The most abundant species were horned lark, rock wren and mountain bluebird.

3.2.1.14.2 Amphibians and Reptiles

Five badlands habitats totaling 457.6 ha and requiring 25 man hours were searched for amphibians and reptiles from 8 June to 17 August, 1980.

Species Occurrence and Relative Abundance

A small great basin spadefoot population and one eastern short-horned lizard were located at site H-53; and site H-34 yielded northern plateau and northern sagebrush lizards (Table 18).

Site H-53 (Wild Rose Spring) contained numerous spadefoot tadpoles. At night approximately 35 adults were vocalizing in the wash within 200 m of the spring. One adult was captured, identified and released. Remains of one short-horned lizard was identified in one of five ferruginous hawk nests nearby. Adequate habitat for other reptile species occurs here, but none were found.

Table 18. Site locations of four amphibian and reptile species at two badlands habitats.

Species	Badlands Sites	
	H34	H53
Great Basin Spadefoot		X
Northern Plateau Lizard	X	
Northern Sagebrush Lizard	X	
Eastern Short-horned Lizard		X

Site H-34, the largest area surveyed, only turned up two lizard species. Adults were observed, but few in number. Heavy rainfall and cold temperatures prevailed intermittently during the survey at this site.

Badlands habitat contained the largest sample area (457 ha). Only one amphibian and three reptile species were observed. Extreme cold and heavy rainfall on the survey date at site H-34 most likely contributed to such low numbers and low species for that area. However, site H-53 also should be able to support a higher diversity of reptile species. Prairie rattlesnakes (Crotalus viridus viridus) had been reported in previous years in the Haystack area (Jim Dunder and Dick Randall, personal communication).

Badlands site H-27, should support some lizard species. The rugged terrain consisted of juniper with sagebrush and greasewood comprising the understory. Cool days, approximately 20.6°C, could have contributed to a lack of reptiles at this site. A comparison to other sites in juniper habitat suggests that most likely one or more reptile species may be present.

3.2.1.15 Cliffs, Butte Tops, Outcrops

These habitats commonly occur throughout the entire study area and also exhibit a lack of vegetation. Some of the more predominate plant associations are: big sagebrush, greasewood, saltbush, forbs and grasses. Cliffs, butte tops, and outcrops can be found at various elevations above 2133 meters. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.15.1 Birds

Species Occurrence

Twenty-seven bird species were found at outcrop sampling sites (n = 4). Appendix 8o lists 22 species found during transect sampling. Five additional species were recorded at these locations but not during transect sampling periods (Table 19).

No species were unique to this habitat type (Appendix 9). Rock wrens were present in all four locations and are characteristic of this habitat type.

Table 19. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-29a	Golden eagle American kestrel Common flicker Say's phoebe	
T-110	Barn swallow Red-breasted nuthatch Yellow-rumped warbler	
T-74	Golden eagle	active nest located
T-338	Great horned owl	roost

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8o shows specific density estimates per transect in the outcrop habitat.

The most abundant species were rock wren, violet-green swallow, pinyon jay and horned lark. Bewick's wren, a species of high interest in Wyoming, was recorded in T-29a.

3.2.1.15.2 Amphibians and Reptiles

Four outcrop habitats totaling 25 ha and requiring 35 man-hours were searched for amphibians and reptiles from 5 May to 19 August 1980.

Species Occurrence and Relative Abundance

Site H-5 located in the Firehole Basin, was the only site where reptile species occurred in this habitat type. Four species occupied this site: northern plateau lizard, northern sagebrush lizard, tree lizard, and eastern shorthorned lizard.

The northern plateau lizards and northern sagebrush lizards were common throughout the site.

One adult tree lizard was observed in a crevice, near the cliff. This habitat is similar to site H-49 where the other tree lizard was observed. Eastern short-horned lizards were not observed, but a scat from a large adult was discovered on a rock where it apparently had been basking.

Outcrop site H-5 was unlike the other three outcrop habitats. Juniper was the dominant vegetation with sagebrush and mountain mahogany comprising the

understory. The strata consisted of large boulders and a rocky cliff. This site is very similar to many sites in the Firehole Basin where numerous reptiles have been located, i.e., H-1, H-2, H-3, and H-49. The outcrop appearance is the major difference, however, the other rock and vegetation similarities are identical.

The other three outcrops lacked vegetational cover, so that cover would be a limiting factor for reptiles to occur at these sites.

Site H-38 appeared volcanic and was unique, unlike any of the other outcrop habitats. This site appears to be excellent habitat for rattlesnakes, but cold windy days prevailed during the survey dates and prevented any reptiles from being observed.

3.2.1.16 Sand Dunes

Sand dunes in the Great Basin are uncommon and are usually associated with prehistoric lakebed erosion by winds. Sand dune habitat only occurs in the northern portion of the study area at elevations above 2042 meters. Numerous intermittent and perennial ponds form at the bases of the rolling dunes. Aquatic vegetation is associated with these ponds. Other dune vegetation includes big sagebrush, rabbitbrush (*Chrysothamnus* sp.) Russian thistle (*Salsola* sp.), other forbs and grasses. Refer to Appendices 5, 6 and 7 for soils and climate data on the sampling sites.

3.2.1.16.1 Birds

Species Occurrence

Fifteen bird species were found in dune habitats. Appendix 8p lists eight species found during transect sampling (n = 4 sites). Seven additional species were recorded at these locations but not during transect sampling periods (Table 20).

Five species were unique to this habitat type (Appendix 9): pintail, American coot, long-billed curlew, spotted sandpiper, Wilson's phalarope.

Horned lark was the only species found in all four locations. The preponderance of water-associated birds at T-313 and T-70 was due to the presence of small dune marsh areas in the immediate area.

Table 20. Bird species observed in transect vicinity but not during transect sampling.

Location	Species	Notes
T-313	Mallard	
	Pintail	
	Prairie falcon	2 adults together
	American coot	
	Wilson's phalarope	
	Barn swallow	
	Sage thrasher	
T-314	Spotted sandpiper	
T-70	Pintail	
	Marsh hawk	
	Long-billed curlew	
	Wilson's phalarope	

Density

Table 2 summarizes the bird density estimates (mean values) for the sixteen habitats sampled. Appendix 8p shows specific density estimates per transect in the dune habitat.

The most abundant species were horned lark, vesper sparrow and killdeer.

3.2.1.16.2 Amphibians and Reptiles

Four sand dune habitats totaling 40 ha and requiring 44 man-hours were searched for amphibians and reptiles from 9 May to 2 September 1980.

Species Occurrence and Relative Abundance

Amphibians and reptiles occurred at all four sites (Table 21). Blotched tiger salamanders (*Ambystoma tigrinum melanostictum*) occupied sites H-41 and H-104. Great basin spadefoot populations occupied sites H41, H-104 and H-54. On 22 May, a pond survey at sites H-41 and H-104 revealed many thousands of spadefoot tadpoles approximately a few days old. Some subadults were also observed. At night, thousands were heard vocalizing as the height of the breeding season came to a climax. Some breeding was noted as late as the first few days of June, by evidence of two day old tadpoles. A small population of spadefoot tadpoles were observed in one pond at site H-54.

Four adult tiger salamanders and six larvae were located at site H-41. The breeding period had taken place earlier than May as judged from the size of this year's larvae. Stebbins (1966) reports that breeding takes place in this area from March to June depending on the severity and length of winter.

Table 21. Site locations of five amphibian and reptile species at four sand dune habitats.

Species	Sand Dune Sites			
	H41	H104	H51	H54
Blotched Tiger Salamander	X	X		
Great Basin Spadefoot	X	X		X
Ornate Box Turtle[1/]	X			
Eastern Short-horned Lizard			X	X
Wandering Garter Snake[1/]	X			

[1/] supected to occur based on tracks, scats, and personal communication with Jim Dunder and Dick Randall.

Adult eastern short-horned lizards, located at sites H-51 and H-54 were associated with russian thistle vegetation.

Snake tracks, most likely a wandering garter snake, was discovered at site H-4, but no live specimens were sighted.

Several weathered turtle scats from fall of 1979 were sighted at H-41. Four sightings of unidentified box turtles in this area has been reported by Jim Dunder and Dick Randall. The only box turtle known to occur in Wyoming is the ornate box turtle, a subspecies of the western box turtle.

Off-road vehicle (ORV) use appears to be increasing in this area (Dick Randall, personal communication). During the survey, a few dead spadefoots were sighted lying in tracks made by a dune buggy in and adjacent to the breeding ponds. One dune buggy was observed attempting to scale a steep dune bank; and some of the shallower breeding ponds showed evidence of ORV use across them.

Sand dune habitat is restricted to the northern portion of the study area. A narrow east-west strip, 85 km in length and 1.5-6.5 km in width is located approximately 48 km north of Rock Springs, Wyoming. Many ephemeral and perennial ponds widely distributed over the dunes provide excellent breeding habitat for great basin spadefoots and blotched tiger salamanders. Extremely dense spadefoot populations occur in numerous ponds in and adjacent to sites H-41 and H-104. Tiger salamanders are more difficult to locate, however, at this time, the population appears to be very successful.

As ORV use in this habitat increases, it is likely that the amphibian and some reptile populations will drastically change. Over a period of time, an increase of ORV use across the breeding ponds may alter the water chemistry by introduction of toxic pollutants (gasoline, oil, and other

fuels) into the ponds which could hinder or eliminate these ponds' full potential to provide adequate breeding habitat for amphibians.

Ornate box turtles, a suspected range extension, most likely occur in this habitat. Range maps in Stebbins (1966) and Baxter and Stone (1980) indicate that this turtle is found in the extreme south-eastern portion of Wyoming near the Nebraska border. Unless a few of these turtles have been transplanted here by persons unknown, a range extension is highly suspected.

3.2.2 BIRD DIVERSITY

Two indices of bird diversity for each of the sixteen habitats sampled are presented in Table 22: Shannon-Weaver Index and an area-based index. Shannon-Weaver Index values ranged from 0.55-2.50 with sagebrush-grass being the least diverse and mixed-conifer being the most diverse. The area based values ranged from 0.30-5.20 species per hectare in highland sagebrush-grass and riparian forest habitats, respectively.

3.2.3 BIRD BIOMASS

Table 23 compares the minimum biomass estimates for birds found in the sixteen habitats sampled. Values range from 11.0 grams per hectare in saltbush-greasewood to 493.7 grams per hectare in riparian forest. Such estimates are recognizably crude; however, the results of these estimates in conjunction with density and diversity estimates yield insights to the relative significance of each habitat type in providing food and cover for the birds inhabiting the region.

3.2.4 OWLS

Four owl species were recorded in eleven habitats (Table 24). The most common species was the great horned owl. A saw-whet owl was recorded in mixed-conifer habitat. Long-eared owls were found in big sagebrush-grass and riparian shrub habitats.

Owl pellets were collected at thirteen locations and analyzed for prey species composition. The results of these analyses are presented in Appendix 11.

Table 22. Comparisons of bird species richness and diversity in sixteen habitats.

Habitat	No. Transects	Richness[1/]	Shannon-Weaver Diversity Index[2/]	Area-based Diversity Index[2/3/]
Mixed Conifer	5	38/46	2.50 ± 0.18	3.20 ± 0.95
Limber Pine	4	24/29	1.92 ± 0.29	1.50 ± 0.51
Juniper	5	34/36	2.24 ± 0.44	1.92 ± 0.28
Mountain Shrub	6	40/40	1.85 ± 0.37	2.27 ± 0.92
Saltbush-Greasewood	6	21/28	1.28 ± 0.25	0.97 ± 0.66
Basin Big Sagebrush	3	17/20	1.50 ± 0.18	1.67 ± 0.11
Big Sagebrush Grass	5	22/29	1.78 ± 0.31	0.94 ± 0.27
Highland Sagebrush Grass	4	6/8	0.55 ± 0.53	0.30 ± 0.14
Aspen	6	50/52	2.34 ± 0.16	3.43 ± 2.85
Riparian Forest	4	36/44	2.48 ± 0.27	5.20 ± 2.23
Riparian Shrub	3	34/39	2.37 ± 0.19	4.53 ± 1.50
Riparian Meadow	3	19/23	1.81 ± 0.13	1.23 ± 0.35
Mountain Meadow	4	11/11	0.97 ± 0.29	0.48 ± 0.17
Badlands	4	14/18	1.41 ± 0.78	0.63 ± 0.28
Outcrops	4	22/27	2.01 ± 0.60	1.45 ± 0.53
Dune	4	8/15	0.79 ± 0.38	0.33 ± 0.05

[1/] First value equals average number of bird species recorded in the transects during transect sampling. Second value equals total number of species recorded in the habitat regardless of occurrence in or during a transect sample.

[2/] Values given as mean ($\overline{X}$) plus or minus the standard deviation, using values presented as D-Total in Appendix 8.

[3/] Total number of species recorded on three consecutive transect replicates divided by the area of the transect coverage.

Table 23. Bird biomass estimates for sixteen habitat types. Values are given as grams per hectare.

	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush Greasewood	Basin Big Sagebrush	Big Sagebrush Grass	Highland Sagebrush Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrop	Dune
Mourning Dove	26.8	X	87.1	X	X	X	X	X	52.3	45.6	46.9	+	+	+	+	
Broad-tailed Hummingbird	X			X						0.6	0.5					
Common Flicker	X	+	X	X	X				16.0	78.0	40.0			X		
Eastern Kingbird									X	23.1						
Dusky Flycatcher				X					3.2	X						
Gray Flycatcher			4.4						X							
Empidonax sp.		X		X					2.1	4.1						
Western Wood Pewee	X	X							X	1.7	X					
Horned Lark		2.6		X	X	+	4.4	28.1	X			X	17.9	8.1	3.1	12.2
Violet-green Swallow	+	X	X	X	X	X	+		10.2	5.1	1.2	X	X	X	2.4	
Black-billed Magpie			X	X	X	164.9	X		X	X	40.8	+	X		+	
Pinyon Jay		31.3	14.0		X		X								14.0	
Clark's Nutcracker	39.0	27.3	X	X				67.6	+	X			46.8			
Black-capped Chickadee	2.3			X		X			X	1.9						
Mountain Chickadee	6.5			X					X							
Red-breasted Nuthatch	5.6	X							+							
Brown Creeper	0.9														X	
House Wren				+					8.6	18.0	1.3					
Bewick's Wren			4.1												X	
Rock Wren	X	6.8	X	+		X	X		X				X	2.4	5.4	
Sage Thrasher		X	X	X	5.9	9.9	+	X			33.7			X		
American Robin	18.2	7.9	+	14.2		X	X	+	101.1	133.5		+	+	X	+	
Hermit Thrush	8.4								X	X						
Mountain Bluebird	3.0	7.0	12.6	6.6	X	X	4.4	+	5.2	6.8	4.0		4.0	2.6	+	
Ruby-crowned Kinglet	1.0															
Loggerhead Shrike					5.1									X		
Starling			X						10.3	23.7	14.2	X				
Warbling Vireo	X			1.8					10.5	10.4	X					
Yellow Warbler				X					X	3.7	8.0					
Yellow-rumped Warbler	2.8								1.8							
Black-throated Gray Warbler		X	1.4													
MacGillivray's Warbler	X			6.8					1.3	5.3	5.4				X	
Western Meadowlark							X					11.5				
Red-winged Blackbird												15.4				
Brewer's Blackbird			X	+	X	8.8	X		7.5	40.1	69.4	38.1	17.7		X	X
Purple Finch	X								4.8	11.9						
Cassin's Finch	2.9			X												
House Finch		X	6.6													
Pine Siskin	9.8								X	X						
Green-tailed Towhee	3.9	5.7	X	31.2	X	21.9	3.9		9.3	13.5	11.4				+	X
Savannah Sparrow												2.6				
Sage Sparrow			X	X	X	4.3	10.3							+	+	X
Gray-headed Junco	20.9			X					13.9							
Chipping Sparrow	X	X	4.2	1.3	X					X					+	
Brewer's Sparrow			1.3	6.7	X	24.1	5.4		X	X	1.7	X		+		
White-crowned Sparrow	X			X					+	15.7	16.2					
Fox Sparrow										X	30.4					
Song Sparrow				X	X	3.4	2.9		X	51.0	31.7	+				
Totals	152.0	88.6	135.7	68.6	11.0	237.3	31.3	95.7	258.1	493.7	356.8	67.6	86.4	13.1	24.9	12.2

X = Bird observed on one or more transects but average density less than 0.1; plus bird seen on less than 50% of the transects.

+ = Occurs at low density (less than 0.1); plus seen on 50% or more of the transects.

Table 24. Owl occurrence in eleven of sixteen habitats sampled.

Habitat	Species	Location	Observed	Nests
Mixed Conifer	Great Horned Owl	T-128	5	2
	Saw-whet Owl	T-128	1	
Limber Pine	Great Horned Owl	T-126	2	
		T-57	1	
Juniper	Great Horned Owl	T17N R106W Sec 12	1	
		T-20a	1	
		T-302	2	
		T-77	1	
		T-52	1	
Saltbush Greasewood	Great Horned Owl	T-301a	1	
		T-122	1	
Big Sagebrush Grass	Great Horned Owl	T15N R102W Sec 36	1	
		T16N R102W Sec 4	1	
		S-10	1	
		S-31	2	
	Long-eared Owl	S-21	1	
		S-19	1	
		S-31	2	
	Burrowing Owl	T23N R101W Sec 32	2	1
		T21N R104W Sec 31	1	
		T22N R103 Sec 16	1	1
		T21N R104W Sec 5	3	1
		T18N R100W Sec 36	1	
		T17N R100W Sec 1	1	
Aspen	Great Horned Owl	T-316	1	
		T-371	1	1
		T-335	1	
Riparian Forest	Great Horned Owl	T-329	1	
Riparian Shrub	Great Horned Owl	T-307a	1	
	Long-eared Owl	T-337	5	1
Riparian Meadow	Great Horned Owl	T-86a	1	
Badlands	Great Horned Owl	T-304	1	
Outcrops	Great Horned Owl	T-110	3	
		T-338	1	

3.3 DISCUSSION

3.3.1 BIRDS

3.3.1.1 Density and Diversity

Figure 3 shows mixed conifer, aspen, riparian forest and riparian shrub as the habitats supporting the greatest number of bird species. Mixed conifer is a diverse habitat that is often associated with aspen or riparian vegetation. As vegetation diversity increases, the data indicate that species richness also increases. The presence of water, particularly permanent seeps or springs, added greatly to bird species richness and diversity.

The overall bird species assemblage of a particular habitat was rarely reflected in any single transect location. The general categories, e.g. riparian shrub, often were quite variable with one sampling location revealing a species list greatly different from another location of the same general habitat type. Local conditions, such as micro-habitat features, ecotone associations, or slope and exposure often noticeably contributed to this sampling location variation.

Overall, 117 bird species were recorded in the study area. Slightly less than half of these were recorded in aspen habitats; the average was about 20%. Therefore, the data indicate that birds utilizing habitats found in the region are highly segregated by specific niche requirements and very localized physical and environmental conditions.

Table 2 compares bird density in sixteen habitats. Density estimates ranged from 0.26-12.96 birds per hectare, in saltbush-greasewood and riparian forest, respectively. Densities in aspen and riparian shrub habitats were relatively high in comparison to the more arid habitats sampled. Four habitats were estimated to support less than one bird per hectare: dunes, outcrop, badlands and saltbush-greasewood.

Table 22 compares bird richness and diversity (Figure 3) indices for the sixteen habitat types. Diversity (Shannon-Weaver) is a function of increasing species richness and how evenly those species are proportioned in the population. Higher diversity implies a greater number of species and a relatively even distribution (density) per species. Mixed-conifer and riparian were the most diverse habitats. Highland sagebrush-grass and dune were the least diverse.

Species of high interest include sage grouse and Bewick's wren. Sage grouse were evident in four of the habitats sampled: basin big sagebrush, highland sagebrush-grass, riparian forest and badlands. Bewick's wrens were only seen in juniper and outcrop habitats.

3.3.1.2 Owls

Table 24 summarizes all owl observations recorded during the study. Appendix 11 gives pellet analyses results. Great horned owls are the most abundant and widespread owl found in the region. Rabbits made up most of their diet in addition to a wide range of rodents.

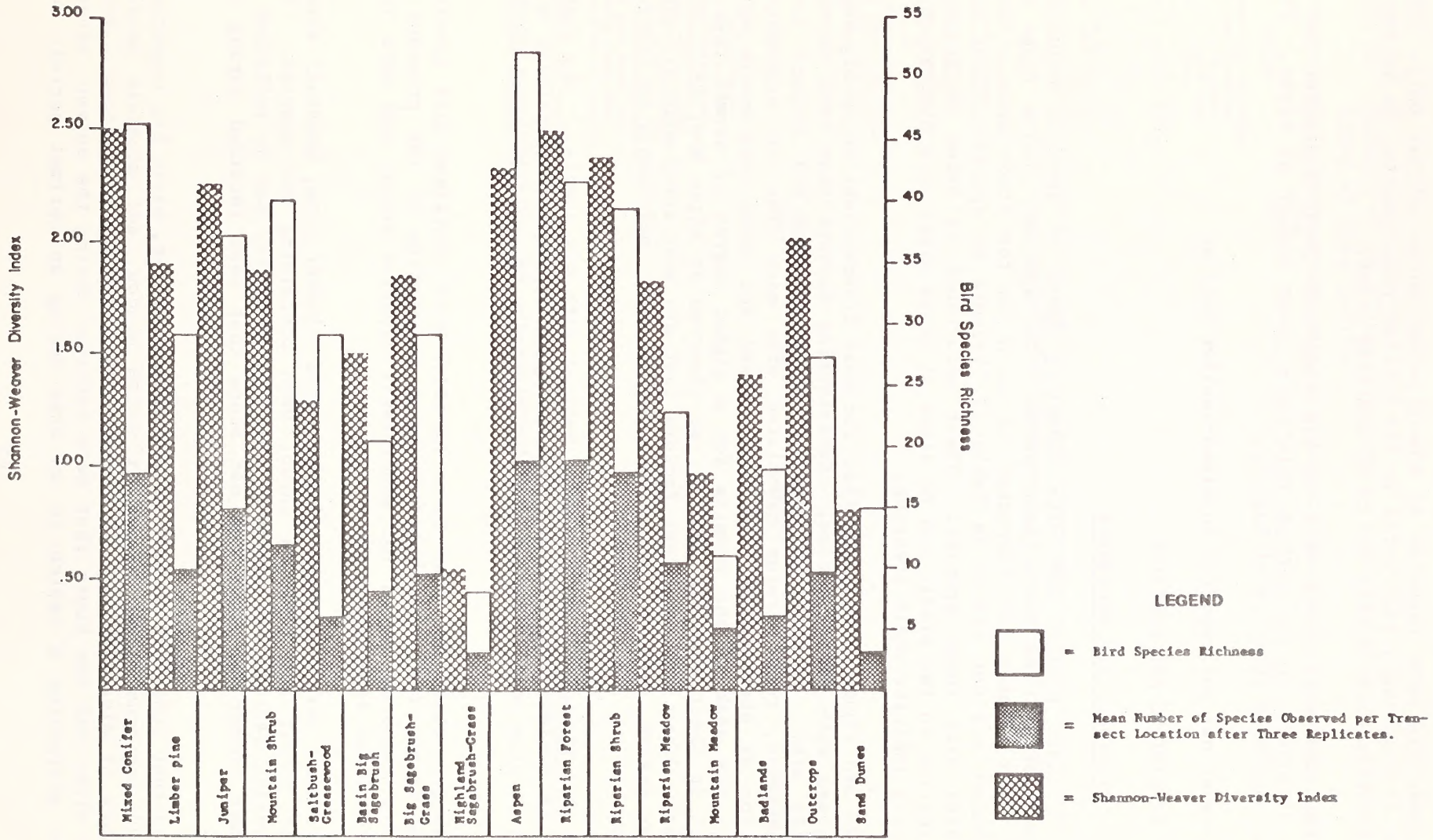


Figure 3

Comparisons of Bird Species Richness and Shannon-Weaver Diversity Indices in Sixteen Habitats

Long-eared owls were reported in the riparian shrub habitat only. This species is relatively restricted in its habitat requirements, as evidenced by their occurrence in only one of 70 sampling areas.

Burrowing owls were found only in big sagebrush grass habitats, but in enough locations to indicate a relatively large number of birds. Prey species consisted entirely of insects.

One saw-whet owl was reported in mixed-conifer habitat.

3.3.2 AMPHIBIANS AND REPTILES

3.3.2.1 Diversity and Abundance

Table 25 lists habitat and site diversity based on species occurrence for ten habitats and forty-three sites. Two species, chorus frogs and prairie rattlesnakes are suspected to occur on the study area. These two species are not listed in Table 25, because no specific sites were associated with these species. Their occurrence is based on personal communication in two areas; and no signs at these areas were discovered to positively indicate their presence.

Table 26 and Figure 4 indicate that the most diverse habitat is big sagebrush-grass with seven species. Contributing factors that lead to this diversity are: presence of ponds where salamanders and leopard frogs were observed, rock stratum associated with more than one subdominant vegetation as observed at site H-11, paved and unimproved roads which reptiles may seek in the evening for a higher degree of warmth than is provided in their occupied habitat, as observed at sites H-6, H-11, H-57 and H-58. Other very important factors that are associated with all sites are prey search, seeking cover, and locating other individuals to initiate breeding.

Juniper was the second most diverse habitat with six species. The combination of juniper-sagebrush-mountain mahogany vegetation associated with a rocky stratum contributed to the high diversity of reptiles found in this habitat.

Saltbush-greasewood and sand dunes habitats both contained five species. The key factor for these habitats is a combination of the presence of ponds and temporary pools for amphibians, riparian zones, and more than one subdominant vegetation.

Habitats that were the least diverse were: limber pine, mountain shrub, riparian forest and riparian shrub, each containing one species. The contributing factor that leads to this low diversity may be reflected in the fewer number of sites and man hours that were recorded during the survey.

Habitats that contained no species were mixed conifer, basin big sagebrush, highland sagebrush-grass, aspen, riparian meadow, and mountain meadow. This lack of diversity may be a result of a variety of factors: fewer number sites and man hours that were recorded during the survey, adverse weather postponing a search in an area during an optimal period, cold

Table 25. Summary of amphibian and reptile occurrence in ten habitat types by site location.

Species	Limber Pine	Juniper												Mountain Shrub
	H55	H1	H2	H3	H4	H8	H15	H17	H44	H46	H49	H56	H59	H48
Blotched Tiger Salamander														
Utah Tiger Salamander														•
Great Basin Spadefoot														
Northern Leopard Frog														
Ornate Box Turtle														
Northern Plateau Lizard					•		•	•			•			
Northern Sagebrush Lizard	•	•	•	•		•	•	•	•	•	•	•		
Tree Lizard											•			
Eastern Short-horned Lizard							•				•			
Great Basin Gopher Snake											•			
Wandering Garter Snake														
Midget Faded Rattlesnake													•	

Species	Saltbush-gressewood										Big Sagebrush-grass									
	H7	H10	H22	H33	H35	H36	H37	H42	H52	H60	H6	H11	H28	H29	H47	H50	H57	H58	H61	H62
Blotched Tiger Salamander																				
Utah Tiger Salamander					•	B	B								•					
Great Basin Spadefoot	•																			
Northern Leopard Frog													•	•						
Ornate Box Turtle																				
Northern Plateau Lizard												•								
Northern Sagebrush Lizard												•								
Tree Lizard																				
Eastern Short-horned Lizard			•							•						•			•	•
Great Basin Gopher Snake											•	•					•	•		
Wandering Garter Snake					•				•	•										
Midget Faded Rattlesnake		•										•								

Species	Riparian Forest	Riparian Shrub	Badlands		Outcrop	Sand Dunes			
	H31	H12	H34	H53	H5	H41	H51	H54	H104
Blotched Tiger Salamander						•			•
Utah Tiger Salamander									
Great Basin Spadefoot				•		•		•	•
Northern Leopard Frog	•								
Ornate Box Turtle						A			
Northern Plateau Lizard			•		•				
Northern Sagebrush Lizard			•		•				
Tree Lizard					•				
Eastern Short-horned Lizard				•	A		•	•	
Great Basin Gopher Snake									
Wandering Garter Snake		•				A			
Midget Faded Rattlesnake									

A = Suspected to occur based on scats, tracks, and personal communications.
B = Suspected subspecies; identified only as tiger salamander

Table 26. Relative abundance and distribution of amphibians and reptiles in sixteen habitat types.

Common Name	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush-Greasewood	Basin Big Sagebrush	Big Sagebrush-Grass	Highland Sagebrush-Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrops	Sand Dunes
Blotched Tiger Salamander[1/]																C
Utah Tiger Salamander[1/]				U	C		U									
Great Basin Spadefoot[2/]					C								U			C
Northern Leopard Frog[2/]							U			U						
Ornate Box Turtle																UD
Northern Plateau Lizard			C				U						C			
Northern Sagebrush Lizard		U	C				U						C			
Tree Lizard			R											R		
Eastern Short-horned Lizard			C		C		C						U			C
Great Basin Gopher Snake			U				C									
Wandering Garter Snake					C						U					U
Midget Faded Rattlesnake			R		R		R									

1/requires perennial aquatic habitat for breeding.
2/requires perennial or ephemeral aquatic habitat for breeding.
UD = undetermined

R = rare
U = uncommon
C = common

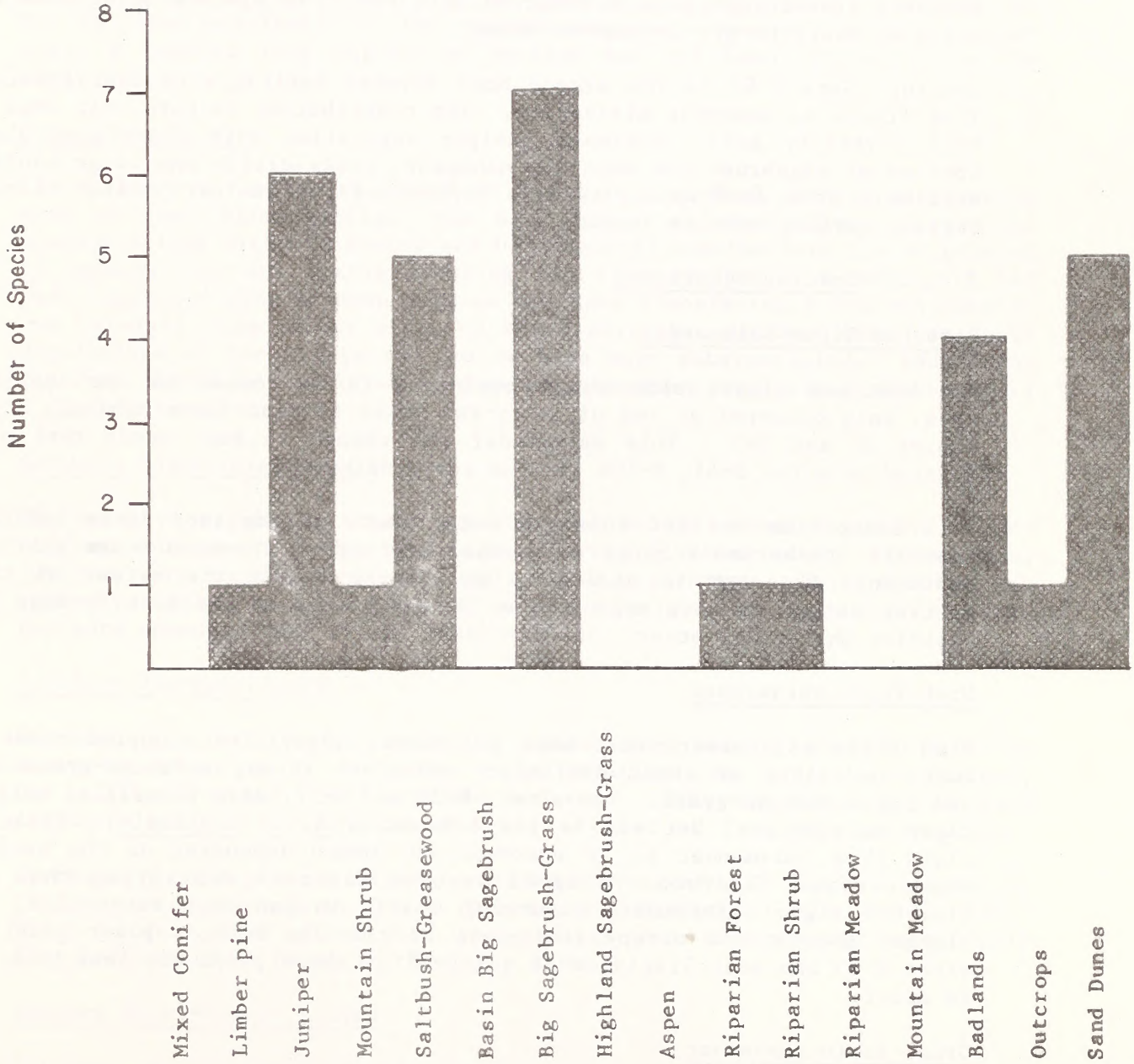


Figure 4 Comparison of amphibian and reptile (combined) species richness in sixteen standard habitat types.

temperatures inhibiting occurrence above ground and the fact that some amphibians and reptile species may not be associated with these habitats in southwestern Wyoming.

Habitat diversity is somewhat biased in favor of big sagebrush-grass, juniper and saltbush-greasewood since the total number of surveyed sites and man-hours were significantly higher than for the other sites of the remaining thirteen habitats. For example, 44% of the total number of sites and 42% of the total man hours were recorded in search of amphibians and reptiles for big sagebrush-grass, juniper and saltbush-greasewood habitats. However, five occupied sites occurred as a result of species being observed while en route to pre-determined areas.

Outcrop (Site H-5) is the second most diverse habitat with four species. This figure is somewhat misleading. The contributing factors that lead to this diversity are: dominant juniper vegetation with associated plant species of sagebrush and mountain mahogany, rocky cliffs and large boulder stratum. This description is also typical of the juniper habitat characterized earlier in this section.

3.3.2.2 Species Occurrence

Blotched Tiger Salamander

The blotched tiger salamander, considered to be common in one specific area, only occurred at two of forty-two sites on sand dunes habitat. (see Tables 25 and 26). This salamander was common in many ponds that were located at sites H-41, H-104 and the surrounding area.

This subspecies was not known to occur south of the sand dunes habitat, thus its southernmost range in Wyoming may end at the sand dunes habitat. Additional research is needed to positively verify the extent of this species range; as this area may be the only area on the Rock Springs BLM district where they occur.

Utah Tiger Salamander

Utah tiger salamanders that were positively identified occupied three of forty-two sites at three habitats: mountain shrub, saltbush-greasewood and big sagebrush-grass. Two sites, H-36 and H-37, were identified only as tiger salamanders, but may be the subspecies *A. t. utahensis*. Table 26 lists this salamander to be uncommon to common depending on the habitat where it was observed. This salamander was more widespread than the blotched tiger salamander, occurring mostly in man made reservoirs. The highest populations occupy the ponds at the Jim Bridger power plant at sites H-35 and most likely, H-36 and H-37 as these ponds are less than 1.6 km apart.

Great Basin Spadefoot

Great basin spadefoot populations occurred at five of forty-two sites on three habitats: saltbush-greasewood, badlands and sand dunes. Sites H-7 and H-53 contained relative small populations compared to the sites on the sand dunes habitat. Sites H-41, H-104 and the surrounding area, contained

the largest population of spadefoots. Exact numbers were not recorded, however, many thousands are estimated to occur in and around the fresh water ponds. This habitat may be the most critical area for the life cycle of the great basin spadefoot for a population of this magnitude.

Northern Leopard Frog

Northern leopard frogs occurred at three of forty-two sites on two habitats: big sagebrush-grass and riparian forest in the Red Creek area. This area was the only location where leopard frogs were sighted. Baxter and Stone (1980) report that in the Laramie area and others, this species has declined substantially for unknown reasons. However, at the present time, a leopard frog population decline has not been documented in the study area.

Ornate Box Turtle

The ornate box turtle, suspected to occur at site H-41 and the surrounding area on sand dunes habitat, has been listed as undetermined. Personal communications with Jim Dunder and Dick Randall substantiate the occurrence of unidentified box turtle sightings on four occasions; however, it has been suggested that unknown persons may have transferred a few box turtles and released them in the areas of the sightings. At this time, no known populations of the ornate box turtle have been substantiated. Additional research should be initiated to determine whether populations exist and if a range extension has occurred.

Northern Sagebrush Lizard

The northern sagebrush lizard was the most widely abundant species occurring at fourteen of forty-two sites covering five habitats: limber pine, juniper, big sagebrush-grass, badlands and outcrop. This species was commonly sighted at ten of twelve sites in juniper habitat where it occurred more commonly than in any other habitat.

Northern Plateau Lizard

Northern plateau lizards were the second most widely abundant species occurring at seven of forty-two sites covering four habitats: juniper, big sagebrush-grass, badlands and outcrop. This species occurred more commonly in juniper habitat and was sighted at four of twelve sites.

Furthermore, the plateau lizard was always observed with northern sagebrush lizards, except for site H-4. However, the habitat at site H-4 is identical to four other sites that both species were observed and undoubtedly they both could be found at this site as well.

Eastern Short-horned Lizard

Although eastern short-horned lizards were never numerous at any site, they were the most widely distributed reptile occurring at eleven of forty-two sites covering six habitats: juniper, saltbush-greasewood, big sagebrush-grass, badlands, outcrop and sand dunes. This lizard was the only reptile that was associated with white-tailed prairie dog colonies at sites H-60, H-61 and H-62.

Tree Lizard

The tree lizard, considered rare, was the least observed species only occurring at two sites in the Firehole Basin. At site H-5, (outcrop) one adult was located and at site H-49, (juniper) one adult pair was located. Both habitats contain similar niches (rocky cliffs with nooks and crevices) in juniper which these lizards seem to prefer.

Tree lizards reportedly only occur in extreme southwestern Wyoming west of the Green River and close to the Utah border. This lizard has not been documented as far north as the study area, which indicates that a range extension was discovered during the present study. Additional research for this lizard regarding its population and present range should be initiated.

Great Basin Gopher Snake

Great basin gopher snakes occurred at five of forty-two sites in juniper and big sagebrush-grass habitats. Four locations occurred in big sagebrush-grass and one occurred in juniper. Three of five sightings were associated with roads. The other two sites (H-49 and H-11) only yielded molted skins. Even though this snake was quite common in big sagebush habitat it was uncommon in juniper.

Wandering Garter Snake

This species is considered to be the most common and widely distributed snake in Wyoming by Baxter and Stone (1980). It occurred only at five of forty-two sites in three habitats: saltbush-greasewood, riparian shrub and sand dunes. According to range maps in Baxter and Stone (1980) there are museum specimens from four locations in Sweetwater County, but only one location occurs in the study area. This snake may not be as common in the study area as it is in other portions of Wyoming. All of the sightings occurred adjacent to a water source, which indicates that this snake prefers areas where aquatic habitat exists. One late report (Dick Randall, pers. communication) indicates that three specimens were observed in the Red Creek area associated with aspen communities at elevations of 2438 m close to riparian zones.

Midget Faded Rattlesnake

Two midget faded rattlesnakes and two molted skins were found in the Firehole Basin representing three of forty-two sites in three habitats: juniper, saltbush-greasewood and big sagebrush-grass. This snake was considered rare in the study area, and its range coincided with reports by Baxter and Stone (1980). Other sightings of this species and the areas that it now occupies have been observed by Dick Randall.

IV. BLACK-FOOTED FERRET SURVEY

4.1 METHODS

4.1.1 WHITE-TAILED PRAIRIE DOGS

Methods used to locate prairie dog colonies were based on techniques described by Martin and Schroeder (1979) and Martin and Schroeder (1980). These methods included: aerial reconnaissance, vehicle and foot travel and personal communication.

Initially, colonies were located from BLM records and discussions with BLM personnel. Other colonies were located and approximate locations mapped on topographic maps by flying 100-150 meters above ground in a Cessna 180 airplane.

We primarily surveyed those areas indicated by the BLM as "high priority". Ground searches were conducted from 2 August to 6 September by two and three man teams. Each team systematically walked through each colony accurately mapping boundaries and recording the following data on standard field forms: date, hours searched, observers, resource area, location, elevation, vegetation, number of animals, number of active burrows, number of plugged burrows, black-footed ferret sign and other wildlife. Initially, acreages were determined on topographic maps using a dot grid (100 dots per square inch) and were recorded as hectares (2.47 acres = 1 ha).

Boundaries of colonies were recorded on topographic maps (currently on file at BLM Rock Springs) and identified with a site number. The site number consists of a single letter code "S" followed by a number corresponding to a specific location.

Each colony was photographed with a 35 mm camera. Two representative color slides per colony were labeled with the site number and location.

White-tailed prairie dogs occur throughout most of Wyoming as summarized by Hall and Kelson (1959). They primarily occur in two dominant habitat types: (1) big sage brush-grass (*Artemisia tridentata*) and (2) saltbush (*Atriplex nuttallii*) greasewood (*Sarcobatus vermiculatus*). Also, prickly pear (*Opuntia polyacantha*), other low sagebrush shrubs, forbs, and short grasses are associated with prairie dog occurrence.

BLM requested specific searches of "high priority" areas subject to coal lease evaluations. Searches to verify occurrence in these areas were conducted, emphasizing the following land forms: (1) low rolling hills, (2) valleys, (3) washes and major drainages, (4) elevated plateaus, and (5) along roadsides.

Data on animal species occurrence by habitat site was recorded on 6602-1 forms (Appendix 2). They were used to record the following data on white-tailed prairie dogs: date, area, location, physiographic region, association, special habitat features, biome, ecoregion, status, general and specific use, and additional comments.

A mylar overlay was prepared indicating the boundary, location and site number, and is currently on file with the BLM in Rock Springs, Wyoming.

The methods used to determine white-tailed prairie dog burrow density were a variation of those reported by Tileston and Lechleitner (1966), Clark (1977), Martin and Schroeder (1979) and Martin and Schroeder (1980), all of whom recorded total number of burrows.

Only active burrows were recorded at each site. Badger burrows were not counted unless there was evidence (diggings, scats and direct observation) that prairie dogs were inhabiting them.

Numbers of prairie dogs were recorded at each site, however, these numbers were based entirely on observations while walking through each colony.

Accurate density estimates should include a variety of methods (capture and release, tagging and many hours of observation over a period of months); however, the amount of time designated in the present study for field work was not adequate to determine density estimates.

4.1.2 BLACK-FOOTED FERRETS

The techniques used to locate black-footed ferrets were developed by Henderson et al (1969) in South Dakota. Methods included the following: locating white-tailed prairie dog colonies, searching for ferret sign (scats, tracks, trenching activities and plugged burrows) and nightlighting with a 200,000 candlepower spotlight. Day searches in prairie dog colonies were conducted from 2 August to 6 September by two and three man teams. All burrows were examined for ferret sign. Prairie dog skulls were collected and examined for evidence of ferret predation.

Prior to beginning field surveys, crew members attended a ferret identification training session sponsored by state and federal agency biologists.

Night searches in prairie dog colonies from 15 August to 1 September by two and three man teams were conducted between the hours of 2100-2400 and 0300-0700 from stationary stations 0.16 km apart using a hand-held spotlight. Upon arriving at each station, the vehicle's engine was turned off and a five minute waiting period was established. Next, one observer would rotate the light slowly 360° while the other observer followed the light with binoculars. This technique was repeated three times (for approximately 10 minutes) before moving to the next station until the entire area was searched.

The following data were recorded: date, observers, hours searched, location, site number, number of stations and any other wildlife observed.

Methods to determine the occurrence of black-footed ferrets in the study area were based on a literature review, personal communication with BLM and USFWS personnel in Rock Springs Wyoming. Clark (1978) reports a 25-month search from 1973 to 1975 utilizing procedures developed by Henderson (1969). The methods used included a literature review and mailing ferret photographs with brief narratives to schools, government agencies and county offices in Wyoming. In addition, numerous popular articles were

published, "wanted posters" were distributed which included a $50 reward for information leading to a live ferret observation, and a 35 mm slide series presented to the public on many occasions.

An alternative approach to determine occurrence of ferrets in Wyoming was based on field surveys by USFWS biologists Martin and Schroeder (1979) and (1980). The present study more closely followed this latter, field-oriented approach.

4.2 RESULTS

4.2.1 WHITE-TAILED PRAIRIE DOGS

Prairie dog colonies typically occurred in big sagebrush-grass habitats ranging in elevation from 2000-2180 meters. Other dominant associated plant species included saltbush and greasewood. Most of the sites occurred in washes and valleys usually adjacent to intermittent streams next to low rolling hills. Portions of some colonies extended into big sagebrush greater than one meter tall.

The methods used to locate prairie dog colonies were highly successful. Aerial reconnaissance to initially map general areas where colonies exist, then driving by vehicle to these colonies to gather specific data was by far the best approach to thoroughly cover a widespread area in a short time period. Even the smallest colonies of less than one hectare could be observed from the airplane.

High priority areas, designated by the BLM as KRCRA's, covering 22,267 ha were surveyed from 2 August to 6 September 1980. Forty sites were recorded, but only thirty-nine (totaling 1110 ha) were intensely surveyed (see Appendix 13 for site locations). One site (S-30) was not surveyed due to a restricted area at a hydrogen sulfide gas well. A list of other colonies that were located but not surveyed are currently on file with the BLM in Rock Springs, Wyoming.

The white-tailed prairie dog is primarily a diurnal species, but occasionally may appear above ground at night during ferret nightlighting efforts, as reported by Martin and Schroeder (1980). Adults and young were active at all sites but individuals on some sites remained in their burrows. Thus, no numbers were recorded for such colonies. Prairie dog evidence (feces, fresh diggings and occassional barks from burrows) was indicative that some sites were occupied.

Generally, prairie dog activity was more prominant on warm days and activity declined or subsided during cold temperatures and rainfall.

Prairie dog density was not determined because each site was sampled only once and without systematic quantitative methods. The qualitative approach used adequately met the prairie dog study objectives required by the BLM.

Table 27 lists burrow densities for thirty-nine sites. Active burrows were designated active by evidence of fresh digging, presence of prairie dog feces and direct observation of individuals inhabiting burrows. Burrows that were fillled with soil to the extent of appearing totally abandoned were not counted. Burrows in non-inhabited colonies also were not counted. However, some badger burrows were counted if prairie dog evidence indicated occupancy.

Man-hours recorded during day searches to count and examine burrows totaled 108.4 with a mean of 2.8 man-hours per site. There were 11,853 active burrows counted covering an area of 1110 ha. The mean number of active burrows ranged from 6 to 2,991 per site. Site S-31, extending over 432 ha,

Table 27. Sampling area and burrow densities in forty white-tailed prairie dog colonies sampled for prairie dogs and black-footed ferrets.

Site No.	Hectares	No. of Observers	No. of Plugged Burrows	Burrow Densities: No. Active Burrows	Burrow Densities: No. Active Burrows per Hectare	No. Prairie Dog Skulls Examined	No. Man-hours Per Site
S-1	17.8	2	0	180	10.1	0	1.9
S-2	5.3	2	0	157	29.6	0	1.5
S-3	16.6	2	4	350	21.1	0	2.5
S-4	30.0	3	0	619	20.6	0	2.7
S-5	7.3	2	0	170	23.3	0	1.2
S-6	41.3	3	1	410	9.9	0	3.4
S-7	25.5	3	0	303	11.9	0	2.5
S-8	4.4	2	0	73	16.6	2	0.5
S-9	6.9	2	3	73	10.6	3	1.3
S-10	48.2	3	0	486	10.1	2	3.0
S-11	96.0	3	0	616	6.4	4	6.5
S-12	147.0	3	0	1531	10.4	0	10.7
S-13	40.5	3	0	282	7.0	6	3.7
S-14	1.2	3	0	100	83.3	0	0.5
S-15	16.2	3	1	456	28.1	0	2.5
S-16	0.4	3	0	10	a 25.0	1	0.2
S-17	6.9	3	2	332	48.1	0	1.5
S-18	3.6	3	0	46	12.8	2	0.5
S-19	8.9	3	2	257	28.9	0	3.0
S-20	17.4	1	0	300	17.2	7	1.3
S-21	44.9	2	8	610	13.6	1	4.8
S-22	15.0	1	0	131	8.7	0	0.7
S-23	6.9	2	1	190	27.5	0	1.0
S-24	0.8	1	0	10	a 12.5	0	0.2
S-25	0.4	1	0	6	15.0	0	0.2
S-26	13.0	2	3	218	16.8	0	2.0
S-27	0.4	2	0	30	75.0	0	1.5
S-28	0.8	2	0	25	a 31.2	0	1.5
S-29	0.8	2	0	27	a 33.8	0	0.7
S-30	67.6	-	-	b	-	-	-
S-31	432.0	4	20	2991	6.9	17	33.4
S-32	0.8	1	0	35	a 43.8	0	0.8
S-33	0.8	2	0	57	a 71.2	0	1.2
S-34	2.4	2	0	25	10.4	0	1.4
S-35	0.4	2	0	10	a 25.0	3	0.3
S-36	8.9	2	0	209	23.5	0	1.5
S-37	7.7	2	0	75	9.7	2	2.0
S-38	1.2	2	0	52	43.3	0	1.7
S-39	17.4	2	0	140	8.0	0	1.5
S-40	14.2	2	0	261	18.4	0	1.1
Total	1177.8		45	11,853	925.3	50	108.4
Mean					23.7		2.8
Range					6.4-83.3		0.2-33.4

a Prairie dog colonies that are less than one hectare
b Burrow counts were not conducted due to a posted restricted area.

contained the highest number (2,991) of active burrows with an average of 6.9 burrows per hectare.

Table 28 lists other wildlife that were observed on the forty sites. The most common predator was the badger, which occurred at thirty-seven sites. Other predators of prairie dogs include the coyote and long-tailed weasel. Common avian predators are golden eagles and red tailed hawks. One prairie falcon was observed at site S-31.

4.2.2 BLACK-FOOTED FERRETS

A pre-fieldwork training session sponsored by state and federal agency biologists proved to be a helpful tool in instructing crew members on how to search for ferrets. This type of session is highly recommended to acquaint a team with ferret sign and activity patterns, thus, increasing efficiency of obtaining good results during field surveys.

The entire study area was not surveyed for black-footed ferrets. High priority areas, designated by the BLM, covering 22,267 ha were surveyed from 2 August to 6 September 1980. Forty white-tailed prairie dog colonies were recorded, but only thirty-nine, totaling 1110 ha, were intensely surveyed for ferrets (Appendix 13 for site locations). One colony site (S-30) was not surveyed due to a posted restricted sign in the area of a hydrogen sulfide gas well.

Table 29 summarizes the efforts of the survey. Man-hours recorded during day searches totaled 108.4 with a mean of 2.8 man hours per site. More than 11,853 white-tailed prairie dog burrows were examined for ferrets or their sign (scats, tracks, trenching activities, and plugged burrows). Only forty-five plugged burrows were noted. The number of plugged burrows alone was not significant to determine if ferrets were present, since prairie dogs have been observed plugging burrows inhabited by badgers, weasels, and rattesnakes as reported by Hillman et al (1969).

Fifty prairie dog skulls were collected and examined for evidence of ferret predation as described by Martin and Schroeder (1980), but no canine tooth marks on the rear of the skull were observed. Man-hours recorded during night searches totaled 86.7 with a mean of 2.6 man-hours per site.

Twenty-nine of forty sites were nightlighted from 222 stations between the hours of 2100-2400 and 0300-0700. The mean number of man hours per station was 0.4. Four sites (S-14, S-15, S-19 and S-34) were searched on foot using flashlights, because no access road was available. Six sites (S-24, S-25, S-27, S-28, S-29 and S-32) were not nightlighted due to their small size (less than one hectare), low density of prairie dogs, close proximity to sites that were nightlighted and no evidence during day searches to indicate the occurrence of ferrets. Also, site S-30 was not nightlighted due to the presence of the hydrogen sulfide gas well. No ferret activity was observed during night reconnaissance.

Table 28. Mammal species observed in 40 white-tailed prairie dog colonies.

Location Code No.	White-tailed Hare	Cotton-tail	Thirteen-lined Ground Squirrels	Least Chip-munk	Coyote	Long-tailed Weasel	Badger	Prong-horn Antelope	Bats
S-1	●						●		
S-2					●		●		
S-3					●		●		●
S-4	●	●		●	●		●		●
S-5					●		●		
S-6				●	●		●		
S-7	●			●			●		
S-8							●		
S-9	●						●		●
S-10				●	●			●	●
S-11	●	●		●	●				
S-12		●					●		
S-13	●			●			●		
S-14							●		
S-15		●					●		
S-16							●		
S-17							●		
S-18							●		
S-19							●		
S-20							●		
S-21	●	●			●		●		
S-22							●		
S-23							●		
S-24							●		
S-25							●		
S-26							●		
S-27					●		●		
S-28							●		
S-29							●		
* S-30									
S-31	●	●	●		●		●	●	
S-32							●		
S-33									●
S-34						●	●		
S-35							●		
S-36	●			●	●		●		●
S-37							●		
S-38							●		
S-39		●			●		●		
S-40					●		●		

* Not surveyed due to a "restricted area" status (H_2S gas).

Table 29. Black-footed ferret night surveys in forty white-tailed prairie dog colonies. No ferrets were observed.

Site No	No. of Observers	No. of Stations	No. of Man-Hours Per Station	No. of Man-Hours Per Site
S-1	3	3	0.3	1.0
S-2	3	3	0.4	1.3
S-3	3	4	0.6	2.3
S-4	3	14	0.4	6.3
S-5	3	4	0.4	1.6
S-6	3	15	0.5	7.2
S-7	3	5	0.6	3.0
S-8	3	1	0.8	0.8
S-9	3	4	0.3	1.3
S-10	3	13	0.4	5.1
S-11	3	15	0.4	6.8
S-12	2	26	0.2	5.2
S-13	2	3	0.1	0.4
S-14	3	a	-	0.5
S-15	3	a	-	1.7
S-16	3	1	0.2	0.2
S-17	3	4	0.4	1.6
S-18	3	2	0.1	0.2
S-19	2	a	-	0.5
S-20	2	6	0.3	1.6
S-21	2	13	0.5	6.0
S-22	2	4	0.3	1.0
S-23	2	4	0.5	2.0
S-24	-	b	-	-
S-25	-	b	-	-
S-26	2	5	0.5	2.5
S-27	-	c	-	-
S-28	-	c	-	-
S-29	-	c	-	-
S-30	-	d	-	-
S-31	2	55	0.4	20.9
S-32	-	b	-	-
S-33	2	1	0.3	0.3
S-34	2	a	-	1.0
S-35	2	1	0.2	0.2
S-36	2	4	0.3	1.0
S-37	2	4	0.3	1.0
S-38	2	1	0.2	0.2
S-39	2	4	0.2	0.7
S-40	2	3	0.5	1.5
Total		222	10.6	86.9
Mean Man-Hours			0.4	2.6
Range			0.1-0.8	0.2-20.9

a Surveyed by foot with flashlights

b No nightlighting was conducted due to their small size (1-2 acres), low numbers, no black-footed ferret sign, and close proximity to S_{31}

c No nightlighting was conducted due to their small size (1-2 acres), low numbers, no black-footed ferret sign, and their isolated locations.

d Not surveyed due to a posted restricted area (Hydrogen-sulfide)

4.3 DISCUSSION

4.3.1 WHITE-TAILED PRAIRIE DOG

During this survey, 108.4 man hours by one to four-man teams were utilized during day searches covering an area of 22,267 ha. An additional 12 hours were recorded during aerial surveys. More than 11,853 burrows were examined on thirty-nine sites covering 1110 ha. Table 30 lists the special habitat features found in the colonies.

The mean of 23.6 active burrows per hectare is not to be compared to reports by Tileston and Lechleitner (1966) who presented a mean of 54.3 burrows per hectare or with Clark (1977) who gives a mean of 56.8 burrows per hectare. These studies counted all burrows whether active or inactive. Reports by Martin and Schroeder (1980) also indicate that the range of the mean number of all burrows per acre for six sites was from 12.4 to 54.3. Thus, over a large study area with more than one colony per area, the mean number of burrows per hectare will include a wide range depending on soils, topography, population size and mortality. Therefore, an index correlating population size to burrow density using data from previous studies would be inadequate to estimate numbers of individuals for this survey.

4.3.2 BLACK-FOOTED FERRETS

According to reports by Hillman et al (1979), the most optimum months to search for ferrets are (1) July when the young are active above ground, (2) from late August to November during dispersal of the young and (3) during winter months when trenches and tracks are readily visible.

In conclusion, there was no evidence supporting the presence of black-footed ferrets at thirty-nine colony sites checked during this survey. However, since there is evidence reported by Martin and Schroeder (1979; 1980) based on skulls and ferret skeletal remains, that ferrets did occur and may still occur in southwestern Wyoming, other optimum time periods as discussed above to locate ferrets should be spent searching since there is the possibility that ferrets could disperse to these sites in the near future.

Table 30. Twelve special habitat features identified within twelve white-tailed prairie dog colony sites.

Feature Description	Feature Code*	Habitat	Site	Location	Date Surveyed	Relation to Habitat Site**	Species	General Use	Specific Use
Poles (electrical)	B19	big sagebrush-grass	S14	Firehole Basin SESW Sec. 20 T17N R105W	August 18, 1980	A	golden eagle	-	resting area
Poles (electrical)	B19	big sagebrush-grass	S15	Firehole Basin NW Sec. 20 T17N R105W	August 18, 1980	A	golden eagle	-	roost area
Poles (electrical)	B19	big sagebrush-grass	S16	Firehole Basin NENW Sec. 20 T17N R105W	August 18, 1980	A	golden eagle	-	roost area
Poles (electrical)	B19	big sagebrush-grass	S17	Firehole Basin NWNW Sec. 32 T17N R105W	August 18, 1980	W	golden eagle	-	resting area
Poles (electrical)	B19	big sagebrush-grass	S18	Firehole Basin SWNW Sec. 32 T17N R105W	August 18, 1980	W	golden eagle	-	resting area
Poles (electrical)	B19	big sagebrush-grass	S28	Bitter Creek SESE Sec. 12 T18N R100W	August 26, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S5	Burley Draw NW Sec. 13 T15N R102W	August 3,1 980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S6	Potter Mountain SW Sec. 15 T14N R102W	August 4, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S27	Sand Butte Rim NW NWNW Sec. 7 T17N R100W	August 26, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S31	Burley Draw Sec. 2 T16N R102W	August 27, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S37	Cooper Ridge NE NESE Sec. 30 T17N R101W	August 28, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	S39	Black Buttes NWNW Sec. 12 T18N R100W	August 29, 1980	W	-	-	-

**W - within site
A - adjacent to site

* A - natural feature
B - man-made feature

V. SPECIAL HABITAT FEATURES

5.1 METHODS

Methods to determine special habitat features were based on descriptions provided by the BLM 6602 IHICS manual. Special habitat features were recorded for 16 habitat types from 19 May-9 September. Each special habitat feature was photographed with a 35 mm camera. Two representative color slides per site were labeled with the location and site number. In addition, each feature's location was placed on a mylar overlay using a symbol agreed upon by the BLM and is currently on file with the BLM in Rock Springs, Wyoming.

Special habitat features occur throughout the District and the BLM has already identified many of them. Identification of special habitat features was primarily confined within or adjacent to the selected study sites (e.g., bird transects, prairie dog colonies, amphibian and reptile sites).

Special habitat feature form 6602-2 (See Appendix 2) was used to record the following data: date, area, code number, location, relationship to other habitat sites, description of feature, animal species benefited, general and specific use and the site number.

5.2 RESULTS

Special habitat features, described in the 6602 IHICS manual, are any natural or man made features within or adjacent to habitat sites that may positively or negatively affect wildlife.

Appendix 12 is a listing of the special habitat features that occurred within or adjacent to the bird transects, amphibian and reptile sites, and prairie dog colony sites in all 16 habitat types. The data that appears on these tables was derived from the special habitat feature form, 6602-2. All dashes represented in the last three columns under Animal Species Benefitted indicate that no species, at that time, was associated with that specific feature. Features that do not contain a feature code number have not been assigned a number on the 6602-2 form.

VI. LITERATURE CITED

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APPENDICES

Appendix 1. Birds of the Rock Springs District, Bureau of Land Management.

Common Name	Scientific Name	State Status	Federal Status
Common Loon	Gavia immer	UC,UD	
Arctic Loon	Gavia arctica		
Red-throated Loon	Gavia stellata		
Horned Grebe	Podiceps auritus		
Eared Grebe	Podiceps nigricollis		
Western Grebe	Aechmophorus occidentalis		
Pied-billed Grebe	Podilymbus podiceps		
White Pelican	Pelecanus erythrorhynchos	C,D,HI	
Double-crested Cormorant	Phalacrocorax auritus		
Great Blue Heron	Ardea herodias		HI
Snowy Egret	Egretta thula		
Black-crowned Night Heron	Nycticorax nycticorax		HI
American Bittern	Botaurus lentiginosus		
White-faced Ibis	Plegadis chihi		
Whistling Swan	Olor columbianus	HI	
Trumpeter Swan	Olor buccinator	C,S	
Canada Goose	Branta canadensis	HI	
Snow Goose	Chen caerulescens		
Mallard	Anas platyrhynchos		
Gadwall	Anas strepera		
Pintail	Anas acuta		
Green-winged Teal	Anas crecca carolinensis		
Blue-winged Teal	Anas discors		
Cinnamon Teal	Anas cyanoptera		
American Widgeon	Anas americana		
Northern Shoveler	Anas clypeata		
Redhead	Aythya americana		
Ring-necked Duck	Aythya collaris	UC,UD,HI	
Canvasback	Aythya valisineria	HI	HI
Greater Scaup	Aythya marila		
Lesser Scaup	Aythya affinis	HI	
Common Goldeneye	Bucephala clangula		
Bufflehead	Bucephala albeola	HI	
Ruddy Duck	Oxyura jamaicensis		
Common Merganser	Mergus merganser		
Red-breasted Merganser	Mergus serrator	HI	
Turkey Vulture	Cathartus aura		
Goshawk	Accipiter gentilis		
Sharp-shinned Hawk	Accipiter striatus		
Cooper's Hawk	Accipiter cooperii	HI	
Red-tailed Hawk	Buteo jamaicensis		
Swainson's Hawk	Buteo swainsoni		
Rough-legged Hawk	Buteo lagopus		
Ferruginous Hawk	Buteo regalis	HI	
Golden Eagle	Aquila chrysaetos		HI
Bald Eagle	Haliaeetus leucocephalus	HI,R,D	HI

Common Name	Scientific Name	State Status	Federal Status
Marsh Hawk	Circus cyaneus		
Osprey	Pandion haliaetus	HI	HI
Osprey	Pandion haliaetus	HI	HI
Prairie Falcon	Falco mexicanus		HI
Peregrine Falcon	Falco peregrinus	HI,R,D	HI,FE
Merlin	Falco columbiarus	UC,UD	
American Kestrel	Falco sparverius		
Sage Grouse	Centrocercus urophasianus	HI	
Ring-necked Pheasant	Phasianus colchicus		
Chukar	Alectoris chukar		
Sandhill Crane	Grus canadensis		
Sora	Porzana carolina		
American coot	Fulica americana		
Killdeer	Charadrius vociferus		
Mountain Plover	Charadrius montanus	HI	
Common Snipe	Capella gallinago		
Long-billed Curlew	Numenius americanus	HI,UC,UD	HI
Upland Sandpiper	Bartramia longicauda	UC,UD	
Spotted Sandpiper	Actitis macularia		
Solitary Sandpiper	Tringa solitaria		
Willet	Catoptrophorus semipalmatus		
Baird's Sandpiper	Erolia bairdii		
Marbled Godwit	Limosa fedoa		
Black-necked Stilt	Himantopus mexicanus		
Wilson's Phalarope	Phalaropus fulicarius		
California Gull	Larus californicus		
Ring-billed Gull	Larus delawarensis		
Franklin's Gull	Larus pipixcan		
Caspian Tern	Hydroprogne caspia		
Rock Dove	Columba livia		
Mourning Dove	Zenaida macroura		
Black-billed Cuckoo	Coccyzus erythropthalmus	UC,UD	
Barn Owl	Tyto alba		
Screech Owl	Otus asio		
Great Horned Owl	Bubo virginianus		
Snowy Owl	Nyctea scandiaca		
Burrowing Owl	Speotyto cunicularia	HI,R,UD	
Long-eared Owl	Asio otus		
Short-eared Owl	Asio flammeus		
Saw-whet Owl	Aegolius acadicus		
Poor-will	Phalaenoptilus nuttalli		
Common Nighthawk	Chordeiles minor		
White-throated Swift	Aeronautes saxatalis		
Black-chinned Hummingbird	Archilochus alexandris		
Broad-tailed Hummingbird	Selasphorus platycercus		
Rufous Hummingbird	Selasphorus rufus		
Calliope Hummingbird	Stellula calliope		
Belted Kingfisher	Megaceryle alcyon		
Common Flicker	Colaptes auratus		
Lewis' Woodpecker	Asyndesmus lewis		
Yellow-bellied Sapsucker	Sphyrapicus varius		
Williamson's Sapsucker	Spyrapicus thyroideus		

Common Name	Scientific Name	State Status	Federal Status
Hairy Woodpecker	Dendrocopos villosus		
Downy Woodpecker	Dendrocopos pubescens		
Northern Three-toed Woodpecker	Picoides tridactylus		
Eastern Kingbird	Tyrannus tyrannus		
Western Kingbird	Tyrannus verticalis		
Cassin's Kingbird	Tyrannus vociferans		
Ash-throated Flycatcher	Myiarchus cinerascens		
Say's Phoebe	Sayornis saya		
Willow Flycatcher	Empidonax traillii		
Hammond's Flycatcher	Empidonax hamondii		
Dusky Flycatcher	Empidonax oberholseri		
Gray Flycatcher	Empidonax wrightii		
Western Flycatcher	Empidonax difficulis		
Western Wood Pewee	Contopus sordidulus		
Olive-sided Flycatcher	Nuttallornis borealis		
Horned Lark	Eremophila alpestris		
Violet-green Swallow	Tachycineta thalassina		
Tree Swallow	Iridoprocne bicolor		
Bank Swallow	Riparia riparia		
Rough-winged Swallow	Stelgidopteryx ruficollis		
Barn Swallow	Hirundo rustica		
Cliff Swallow	Petrochelidon pyrrhonota		
Purple Martin	Progne subis	R,P	
Scrub Jay	Aphelocoma coerulescens		
Black-billed Magpie	Pica pica		
Common Raven	Corvus corax		
Common Crow	Corvus brachyrhynchos		
Pinyon Jay	Gymnorhinus cyanocephalus		
Clark's Nutcracker	Nucifraga columbiana		
Black-capped Chickadee	Parus atricapillus		
Mountain Chickadee	Parus gambeli		
Plain Titmouse	Parus inornatus		
Common Bushtit	Psaltriparus minimus		
White-breasted Nuthatch	Sitta carolinensis		
Red-breasted Nuthatch	Sitta canadensis		
Pygmy Nuthatch	Sitta pygmaea		
Brown Creeper	Certhia familiaris		
Dipper	Cinclus mexicanus		
House Wren	Troglodytes aedon		
Bewick's Wren	Thryomanes bewickii	HI	
Long-billed Marsh Wren	Telmatodytes palustris		
Canon Wren	Catherpes mexicanus		
Rock Wren	Salpinctes obsoletus		
Mockingbird	Mimus polyglottos		
Gray Catbird	Dumetella carolinensis		
Brown Thrashwer	Taxostoma rufum		
Sage Thrasher	Oreoscoptes montanus		
American Robin	Turdus migratorius		
Hermit Thrush	Catharus guttata		
Swainson's Thrush	Catharus ustulata		
Veery	Catharus fuscescens		
Western Bluebird	Sialia mexicana	UC,UD	

Common Name	Scientific Name	State Status	Federal Status
Mountain Bluebird	Sialia currucoides		
Townsend's Solitaire	Myadestes townsendi		
Blue-gray Gnatcatcher	Polioptila caerulea		
Golden-crowned Kinglet	Regulus satrapa		
Ruby-crowned Kinglet	Regulus calendula		
Water Pipit	Anthus spinoletta		
Sprague's Pipit	Anthus spragueii		
Bohemian Waxwing	Bombycilla garrulus		
Cedar Waxwing	Bombycilla cedrorum		
Northern Shrike	Lanius excubitor		
Loggerhead Shrike	Lanius ludovicianus		
Starling	Sturnus vulgaris		
Solitary Vireo	Vireo solitarius		
Red-eyed Vireo	Vireo olivaceus		
Warbling Vireo	Vireo gilvus		
Orange-crowned Warbler	Vermivora celata		
Virginia's Warbler	Vermivora virginiae		
Northern Parula	Parula americana		
Yellow Warbler	Dendroica petechia		
Yellow-rumped Warbler	Dendroica coronata		
Black-throated Green Warbler	Pheucticus melanocephalus		
Lazuli Bunting	Passerina amoena		
Evening Grosbeak	Hesperiphona vespertina		
Purple Finch	Carpodacus purpureus		
Cassin's Finch	Carpodacus purpureus		
Cassin's Finch	Carpodacus cassinii		
House Finch	Carpodacus mexicanus		
Pine Grosbeak	Pinicola enucleator		
Gray-crowned Rosy Finch	Leucosticte tephrocotis		
Black Rosy Finch	Leucosticte atrata		
Brown-capped Rosy Finch	Leucosticte australis	R,UD	
Common Redpoll	Acanthis flammea		
Pine Siskin	Spinus pinus		
American Goldfinch	Spinus tristis		
Lesser Goldfinch	Spinus psaltria		
Red Crossbill	Loxia curvirostra		
White-winged Crossbill	Loxia leucoptera		
Green-tailed Towhee	Chlorura chlorura		
Lark Bunting	Calamospiza melanocorys		
Savannah Sparrow	Passerculus sandwichensis		
Grasshopper Sparrow	Ammodramus savannarum		
Vesper Sparrow	Pooecetes gramineus		
Lark Sparrow	Chondestes Grammacus		
Black-throated Sparrow	Amphispiza bilineata		
Sage Sparrow	Amphispiza belli		
Dark-eyed Junco	Junco hyemalis		
Gray-headed Junco	Junco caniceps		
Tree Sparrow	Spizella arborea		
Chipping Sparrow	Spizella passerina		
Brewer's Sparrow	Spizella breweri		
Harris Sparrow	Zonotrichia querula		

Common Name	Scientific Name	State Status	Federal Status
White-crowned Sparrow	*Zonotrichia leucophrys*		
White-throated Sparrow	*Zonotrichia albicollis*		
Fox Sparrow	*Passerella iliaca*		
Lincoln's Sparrow	*Melospiza lincolnii*		
Song Sparrow	*Melospiza melodia*		
McCown's Longspur	*Calcarius mccownii*		

Federal Status:
- FE = endangered
- FT = threatened
- HI = high interest

State Status:
- R = rare
- UC = uncommon
- C = common
- HI = high interest
- D = declining population
- UD = undetermined
- S = stable
- P = peripheral

Source: Bent (1961), Peterson (1961), Robbins et al (1966) and Oakleaf (1979).

Appendix 2. Examples of forms used for data collection.

Appendix 2.

_____ of _____

BIRD TRANSECTS

Habitat: _____ Date Surveyed: _____

Transect #: _____ Location: _____

Species	Species Code

Appendix 2

_____ of _____

OWL TRANSECT FORM

Date: _____ Site #: _____ Habitat Type: _____

Location: _____ Map Ref: _____

Temp: _____ Wind: _____ Sky: _____

Moon phase: F N 1/4 1/2 3/4 Observer: _____

Station	Time	Species	Comments

Appendix 2

Black-Footed Ferret-Prairie Dog Survey

Date _____ Time: From _____ To _____ Examiner(s) _____

Resource Area _____ Sec. _____ ¼ _____ T. _____ R. _____

Land Status P _____ S _____ V _____ Estimated Size (Acres) _____

Topo Map Name _____ Elevation _____

Vegetation Spp. _____

Soil Type: Sandy _____ S. Loam _____ Clay _____ C. Loam _____ Silty Loam _____

Gravely _____ Shaley _____

Burrowing Owls: Yes _____ No _____ Number _____

Plugged Burrows: Yes _____ No _____ Number _____

Badger Activity: Yes _____ No _____ Number _____

Trenching Activity: Yes _____ No _____ Number _____

Number of holes examined _____ Holes/Acre _____

Dot Talley Dot Talley

Other:

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANIMAL SPECIES OCCURRENCE BY HABITAT SITE
CONTINUATION SHEET

(1) Record type	
(2) State	
(3) District	
(4) Planning unit	
(5) Site writeup number	

SECTION IV – ANIMAL OCCURRENCE (CON.)

SPECIES	ECOTONE	STATUS	DENSITY	USE		CRUCIAL	OCCURRENCE		COMMENTS
				GENERAL	SPECIFIC		HYPO	VERIFIED	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SPECIAL HABITAT FEATURE

(1) Record site	W	2
(2) State		
(3) District		
(4) Planning unit		
(5) Site writeup number		

SECTION I – GENERAL

(6) Date ——————

(7) Habitat site name ——————————————————

(8) Acreage ————

(9) Special habitat feature code ———

(10) Location: T———— R———— S—— ¼—— ¼——

(11) Relationship to other habitat sites —

(12) Other habitat sites involved ——————————————————————————

(13) Map or overlay reference ——————————————————————————

(14) General description of feature ——————————————————————————

SECTION II – ANIMAL SPECIES BENEFITED			SECTION III – ANIMAL SPECIES ADVERSELY AFFECTED			SECTION IV – PLANT SPECIES AFFECTED	
SPECIES	USE ENCOURAGED BY FEATURE		SPECIES	USE DISCOURAGED BY FEATURE		SPECIES	EFFECT
	GENERAL	SPECIFIC		GENERAL	SPECIFIC		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)

(Instructions on reverse)

Form 6602–2 (April 1978)

Appendix 3. Equivalent site locations for non-game bird transects, amphibians and reptiles, and white tailed prairie dogs on the Salt Wells-Pilot Butte resource areas of Rock Springs, Wyoming (May-September 1980).

Habitat Type	Bird Transect Site Code	Amphibian and Reptile Site Code	White-tailed Prairie Dog Site Code
Mixed Conifer	T128	H23	
Mixed Conifer	T310	H13	
Mixed Conifer	T38a	H84	
Mixed Conifer	T36	H85	
Mixed Conifer	T320	H92	
Limber Pine	T126	H55	
Limber Pine	T57	H73	
Limber Pine	T114	H74	
Limber Pine	T72	H75	
Juniper	T20a	H8	
Juniper	T302	H3	
Juniper	T77	H56	
Juniper	T14	H15	
Juniper	T52	H95	
Mountain Shrub	T4	H18	
Mountain Shrub	T37	H81	
Mountain Shrub	T12a	H82	
Mountain Shrub	T336	H93	
Mountain Shrub	T318	H98	
Mountain Shrub	T341	H99	
Saltbush-Greasewood	T301a	H7	
Saltbush-Greasewood	T122	H39	
Saltbush-Greasewood	T58a	H66	
Saltbush-Greasewood	T331	H32	
Saltbush-Greasewood	T90	H52	
Saltbush-Greasewood	T339	H96	
Basin Big Sagebrush	T112	H67	
Basin Big Sagebrush	T303	H70	
Basin Big Sagebrush	T33	H20	
Big Sagebrush-Grass	T300	H6	
Big Sagebrush-Grass	T118	H63	
Big Sagebrush-Grass	T119	H64	
Big Sagebrush-Grass	T59	H65	
Big Sagebrush-Grass	T332	H50	
Big Sagebrush-Grass		H60	S1
Big Sagebrush-Grass		H61	S3
Big Sagebrush-Grass		H62	S27

Habitat Type	Bird Transect Site Code	Amphibian and Reptile Site Code	White-tailed Prairie Dog Site Code
Highland Sagebrush -grass	T85a	H69	
Highland Sagebrush -grass	T306	H77	
Highland Sagebrush -grass	T327	H90	
Highland Sagebrush -grass	T319a	H100	
Aspen	T316	H71	
Aspen	T371	H72	
Aspen	T111	H103	
Aspen	T6	H78	
Aspen	T35	H86	
Aspen	T335	H88	
Riparian Forest	T329	H79	
Riparian Forest	T309a	H14	
Riparian Forest	T311a	H102	
Riparian Forest	T321a	H87	
Riparian Shrub	T312	H12	
Riparian Shrub	T307a	H19	
Riparian Shrub	T337	H24	
Riparian Meadow	T86a	H68	
Riparian Meadow	T92	H106	
Riparian Meadow	T308a	H80	
Mountain Meadow	T40a	H83	
Mountain Meadow	T340	H89	
Mountain Meadow	T334	H91	
Mountain Meadow	T317a	H101	
Badlands	T304	H53	
Badlands	T305	H105	
Badlands	T328	H27	
Badlands	T55a	H97	
Outcrop	T29a	H5	
Outcrop	T110	H38	
Outcrop	T74	H76	
Outcrop	T338	H94	
Sand Dunes	T313	H41	
Sand Dunes	T314	H104	
Sand Dunes	T65	H51	
Sand Dunes	T70	H54	

Appendix 4. Amphibians and reptiles of the Rock Springs District, Bureau of Land Management.

Common Name	Scientific Name	State Status	Federal Status
Blotched Tiger Salamander	Ambystoma tigrinum melanostictum		
Utah Tiger Salamander	Ambystoma tigrinum utahensis		
Great Basin Spadefoot	Scaphiopus intermontanus		
Plains Spadefoot[1/]	Scaphiopus bombifrons		
Boreal Western Toad	Bufo boreas boreas		
Boreal Chorus Frog	Pseudacris triseriata maculata		
Northern Leopard Frog	Rana pipiens pipines		
Ornate Box Turtle	Terrapene ornata ornata		
Northern Plateau Lizard	Sceloporus undulatus elongatus		
Northern Sagebrush Lizard	Sceloporus graciosus graciosus		
Northern Side-blotched Lizard[1/]	Uta stansburiana stansburiana		
Tree Lizard	Urosaurus ornatus	HI	
Eastern Short-horned Lizard	Phrynosoma douglassi brevirostre		
Western Yellow-bellied racer[1/]	Coluber constrictor mormon		
Great Basin Gopher Snake	Pituophis melanoleucus deserticola		
Red-sided Garter Snake[1/]	Thamnophis sirtalis parietalis		
Wandering Garter Snake	Thamnophis elegans vagrans		
Prairie Rattlesnake	Crotalus viridus viridus		
Midget Faded Rattlesnake	Crotalus viridus concolor		

HI = High Interest

[1/]may not occur in southwestern Wyoming.

Source: Stebbins (1966), Conant (1975), and Baxter and Stone (1980).

Appendix 5. Soils and climate data for the bird transect locations.

AAP: Average annual precipitation (inches)

AAAT: Average annual air temperature (°F)

AFFP: Average frost-free period (days)

Fractions (e.g. 3/4, 1/4) indicate that the transect covered more than one soil type and that fraction of the transect was in the corresponding soil type.

*T118 and T110, 111 are incomplete but there is no other data available.

Numbers preceded by a "T" indicate bird transects

Numbers preceded by an "S" indicate prairie dog colonies

Numbers preceded by a "H" indicate herp areas (sites)

Location	Description
	1. Mixed Conifer
T128	50% Pishkun Channery Clay Loam/30% Feltonia Fine Sandy Clay Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Moderately steep to steep mountain slopes and ravines; slopes smooth.
T310	40% Feltonia Fine Sand Loam/40% Leavitt Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.
T38a	60% Vinta Sandy Loam/20% Scout Cobbly Sandy Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Gently sloping to moderately steep high mountain slopes; slopes smooth.
T36	60% Vinta Sandy Loam/20% Scout Cobbly Sandy Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Gently sloping to moderately steep high mountain slopes; slopes smooth.
T320	60% Vinta Sandy Loam/20% Scout Cobbly Sandy Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Gently sloping to moderately steep high mountain slopes; slopes smooth.
	2. Limber Pine
T126	40% Horsley Silty Clay Loam/20% Huguston Sandy Loam/20% Rock Outcrop AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Moderately steep and hilly residual uplands over shale and sandstone bedrock
T57	30% Jenkinson Loam/25% Roxal Loam/25% Leavitt Fine Sandy Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days High residual uplands over sandstone and shale bedrock; slopes are smooth.
T114	40% Rock Outcrop/25% Winton Channery Sandy Loam/25% Horsley Silty Clay Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Steep side slopes and rocky escarpments; slopes are irregular and broken.
T72	40% Firehole Channery Loam/30% Jansley Channery Silty Clay Loam/15% Rock Outcrop
2/3	AAP: 7-9" AAAT: 40-45°F Moderately steep and steep sideslopes and spurs; slopes irregular.

25% Cragosen Gravelly Loam/25% Brownstow Gravelly Loam/25% Thermopolis Sandy Loam/10% Rock Outcrop

1/3 AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Sloping to moderately steep residual uplands, alluvial fans, and colluvial deposits. Slopes smooth with some irregularities.

3. Juniper

T29a 40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to steep rocky residual uplands; slopes irregular

T302 30% Redwash Sandy Loam/30% Spool Loamy Sand/20% Rock Outcrop
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days

T20a 40% Rock Outcrop/25% Thermolis Sandy Loam/20% Redcreek Sandy Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Rolling to steep residual uplands; slopes irregular and dissected.

T77 30% Spool Loamy Sand/30% Quealy Variant Fine Sandy Loam/20% Lamarsh Fine Sand
AAP: 10-14" AAAT: 25-40°F AFFP: 60-90 days
Gently sloping to sloping ridge back slopes interspersed with rocky escarpments; slopes smooth and roughly parallel to the sedementary rock beds.

T14 40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop

1/2 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to steep rocky residual uplands; slopes irregular

1/2 No available data.

T52 25% Cragosen Gravelly Loam/25% Brownstow Gravelly Sandy Loam/25% Thermopolis Sandy Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Sloping to moderately steep residual uplands, alluvial fans, and colluvial deposits; slopes smooth with some irregularities.

4. Mountain Shrub

T4 40% Feltonia Fine Sand Loam/40% Leavitt Loam

3/4 AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

50% Piskun Channery Clay Loam/30% Feltonia Fine Sandy Loam

1/4 AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep mountain slopes and ravines; slopes generally smooth.

T37 40% Feltonia Fine Sand Loam/40% Leavitt Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

T12a 40% Feltonia Fine Sand Loam/40% Leavitt Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

T336 50% Pishkun Very Channery Clay Loam/30% Rock Outcrop
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Steep to very steep mountain slopes; slopes irregular

T318 30% Libeg Gravelly Loam/30% Amsden Variant Gravelly Loam/ 20% Teemat Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep side slopes and toe slopes; slopes smooth.

T341 30% Libeg Gravelly Loam/30% Amsden Variant Gravelly Loam/ 20% Teemat Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep side slopes and toe slopes; slopes smooth.

5. Saltbush - Greasewood

T301a 40% Bittercreek Loam/30% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
4/5 Gently sloping and sloping upland plans and pediments; slopes are smooth
35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
1/5 AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

T122 Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

T58a Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

T331 Monte Clay Loam; Strongly Alkaline
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on alluvial fans and bottomlands

T90 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

T339 Grieves Sandy Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days

6. Basin Big Sagebrush

T112 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular

T303 Dines Silt Loam, Very Strongly Alkaline Phase
AAP: 7-9" AAAT: 40-45°F
Deep well drained soil on nearly level alluvial fans and lowlands. Slopes smooth, cut with steep walled gullies.

T33 Villy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-110 days
Deep, somewhat poorly drained soil on level to nearly level alluvial bottomlands along perennial or intermittent streams.

7. Big Sagebrush - Grass

T300 40% Bittercreek Loam/30% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Gently sloping and sloping upland plans and pediments; slopes are smooth

T118 90% Sandy/10% Rock Outcrop

T119 40% Terada Fine Sandy Loam/40% Huguston Fine Sandy Loam
AAP: 7-9" AAAT: 40-45°F

T59 40% Bittercreek Loam/30% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Gently sloping and sloping upland plans and pediments; slopes are smooth

T332 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
2/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular
50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock.

8. Highland Sagebrush - Grass

T85a Rentsal Channery Sandy Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Shallow and well drained soil on gently sloping to sloping residual uplands.

T306 50% Skaggs Channery Loam/20% Starley Channery Sandy Loam/ 20% Millpot Gravelly Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Gently sloping to sloping residual uplands to high table-lands; slopes are smooth.

T327 McCort Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Deep, well drained soil on gently sloping to sloping high table lands; slopes smooth.

T319a 75% Millpot Gravelly Sandy Loam/15% Leavitt Fine Sandy Loam
AAP: 13-17" AAAT: 35-40°F AFFP: < 60 days
Gently sloping to sloping high table lands; slopes long and smooth.

9. Aspen

T316 50% Pishkun Channery Clay Loam/30% Feltonia Fine Sandy Clay Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep mountain slopes and ravines; slopes smooth.

T111 90% Sandy/10% Rock Outcrop

T371 Area not surveyed

T6 50% Piskun Channery Clay Loam/30% Feltonia Fine Sandy Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep mountain slopes and raines; slopes generally smooth.

T35 60% Vinta Sandy Loam/20% Scout Cobbly Sandy Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Gently sloping to moderately steep high mountain slopes; slopes smooth.

T335 40% Teemat Gravelly Loam/20% Teeler Gravelly Sandy Loam/20% Southace Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to very steep alluvial fans and mountain sideslopes; slopes irregular with swales and hummocks.

10. Riparian Forest

T329 Patent Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Deep, well drained soil on alluvial fans and bottom lands

T309a 50% Pishkun Channery Clay Loam/30% Feltonia Fine Sandy Clay Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep mountain slopes and ravines; slopes smooth.

T311a 40% Feltonia Fine Sand Loam/40% Leavitt Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

T321a 3/4 No available data
25% Cragosen Gravelly Loam/25% Brownstow Gravelly Sandy Loam/25% Thermopolis Sandy Loam
1/4 AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
Sloping to moderately steep residual uplands, alluvial fans, and colluvial deposits; slopes smooth with some irregularities.

11. Riparian Shrub

T307a 40% Feltonia Fine Sand Loam/40% Leavitt Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

T312 Pishkun Channery Clay Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Deep, well drained soil on moderately steep to steep mountain sideslopes subject to mass movement; slopes are irregular with hummocks and swales.

T337 60% Hala Quepts/30% Fluvaquents
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level to gently sloping floodplain; slopes smooth with stream banks.

12. Riparian Meadow

T92 60% Hala Quepts/30% Fluvaquents
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level to gently sloping floodplain; slopes smooth with stream banks.

T86a Grieves Sandy Loam
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days

T308a 40% Feltonia Fine Sand Loam/40% Leavitt Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep residual uplands typically in concave snowdrift sites on leeward slopes; slopes smooth.

13. Mountain Meadow

T40a 75% Millpot Gravelly Sandy Loam/15% Leavitt Fine Sandy Loam
AAP: 13-17" AAAT: 35-40°F AFFP: < 60 days
Gently sloping to sloping high table lands; slopes long and smooth.

T340 1/2 40% Teemar Gravelly Loam/20% Teller Gravelly Sandy Loam/20% Southace Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to very steep alluvial fans and mountain sideslopes; slopes irregular with swales and hummocks.

T317a 1/2 75% Millpot Gravelly Sandy Loam/15% Leavitt Fine Sandy Loam
AAP: 13-17" AAAT: 35-40°F AFFP: < 60 days
Gently sloping to sloping high table lands; slopes long and smooth.

14. Badlands

T304 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

T305 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

T328 No available data.

T55a 40% Youjay Sandy Loam/25% Horsley Sandy Clay Loam/25% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to steep breaks and severely eroded mountain slopes; slopes irregular and highly dissected with escarpments and outcrops of bedded shale and sandstone.

15. Outcrops

T110 90% Sandy/10% Rock Outcrop

T74 40% Rock Outcrop/25% Winton Channery Sandy Loam/25% Horsley Silty Clay Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Steep side slopes and rocky escarpments; slopes are irregular and broken.

T338 Badland
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Steep to very steep uplands; slopes irregular and dissected.

16. Sand Dunes

T313 Active Sand Dunes
T314 Active Sand Dunes
T65 Active Sand Dunes
T70 Active Sand Dunes

Appendix 6. Soils and climate data for the amphibian and reptile sampling locations.

AAP: Average annual precipitation (inches)

AAAT: Average annual air temperature (°F)

AFFP: Average frost-free period (days)

Fractions (e.g. 3/4, 1/4) indicate that the transect covered more than one soil type and that fraction of the transect was in the corresponding soil type.

Location	Description
H_1	40% Rock Outcrop/25% Winton Channery Sandy Loam/25% Horsley Silty Clay Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Steep side slopes and rocky escarpments; slopes are irregular and broken.
H_2	40% Bittercreek Loam/30% Haterton Loam AAP: 7-9" AAAT: 40-45°F Gently sloping and sloping upland plans and pediments; slopes are smooth
H_3	30% Redwash Sandy Loam/30% Spool Loamy Sand/20% Rock Outcrop AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
H_4	40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Rolling to steep rocky residual uplands; slopes irregular
H_5	40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Rolling to steep rocky residual uplands; slopes irregular
H_6	40% Bittercreek Loam/30% Haterton Loam AAP: 7-9" AAAT: 40-45°F Gently sloping and sloping upland plans and pediments; slopes are smooth
H_7	40% Bittercreek Loam/30% Haterton Loam AAP: 7-9" AAAT: 40-45°F Gently sloping and sloping upland plans and pediments; slopes are smooth
H_8	40% Rock Outcrop/25% Thermolis Sandy Loam/20% Redcreek Sandy Loam AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days Rolling to steep residual uplands; slopes irregular and dissected.
H_{10}	Dines Silt Loam, Very Strongly Alkaline Phase AAP: 7-9" AAAT: 40-45°F Deep well drained soil on nearly level alluvial fans and lowlands. Slopes smooth, cut with steep walled gullies.
H_{11}	Dines Silt Loam, Very Strongly Alkaline Phase AAP: 7-9" AAAT: 40-45°F Deep well drained soil on nearly level alluvial fans and lowlands. Slopes smooth, cut with steep walled gullies.
H_{12}	Pishkun Channery Clay Loam AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days Deep, well drained soil on moderately steep to steep mountain sideslopes subject to mass movement; slopes are irregular with hummocks and swales.
H_{15} 1/2	40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Rolling to steep rocky residual uplands; slopes irregular
1/2	No available data.

H_{17} Kandaly Loamy Fine Sand/25% Rock Outcrop/25% Winton Channery Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping and undulating to hilly residual uplands cut by short, steep escarpments, slopes smooth with irregular dissected areas.

H_{22} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

H_{28} 30% Libeg Gravelly Loam/30% Amsden Variant Gravelly Loam/ 20% Teemat Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep side slopes and toe slopes; slopes smooth.

H_{29} 30% Libeg Gravelly Loam/30% Amsden Variant Gravelly Loam/ 20% Teemat Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to steep side slopes and toe slopes; slopes smooth.

H_{31} 30% Jenkinson Loam/25% Roxal Loam/25% Leavitt Fine Sandy Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
High residual uplands over sandstone and shale bedrock; slopes are smooth.

H_{33} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

H_{34} 60% Monte Clay Loam/30% Kandaly Fine Sand
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Alluvial fans with scattered sand dunes; slopes complex.
Kandaly Loamy Fine Sand/25% Rock Outcrop/25% Winton Channery Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping and undulating to hilly residual uplands cut by short, steep escarpments, slopes smooth with irregular dissected areas.
Badland
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Steep to very steep uplands; slopes irregular and dissected.

H_{35} Dines Silt Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.

H_{36} Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

H_{37} No available data

H_{41} Active Sand Dunes

H_{42} Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

H_{44} 40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to steep rocky residual uplands; slopes irregular

H_{46} 40% spool Loamy Fine Sand/30% Huguston Sandy Loam/20% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to steep rocky residual uplands; slopes irregular

H_{47} 40% Teemat Gravelly Loam/20% Teeler Gravelly Sandy Loam/20% Southace Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to very steep alluvial fans and mountain sideslopes; slopes irregular with swales and hummocks.

H_{48} 40% Teemat Gravelly Loam/20% Teeler Gravelly Sandy Loam/20% Southace Gravelly Loam
AAP: 15-19" AAAT: 35-40°F AFFP: < 60 days
Moderately steep to very steep alluvial fans and mountain sideslopes; slopes irregular with swales and hummocks.

H_{49} 30% Redwash Sandy Loam/30% Spool Loamy Sand/20% Rock Outcrop
AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days

H_{50} 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
2/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular
50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock.

H_{51} Active Sand Dunes

H_{52} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

H_{53} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

H_{54} Active Sand Dunes

H_{55} 40% Horsley Silty Clay Loam/20% Huguston Sandy Loam/20% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Moderately steep and hilly residual uplands over shale and sandstone bedrock

H_{56} 30% Spool Loamy Sand/30% Quealy Variant Fine Sandy Loam/20% Lamarsh Fine Sand
AAP: 10-14" AAAT: 25-40°F AFFP: 60-90 days
Gently sloping to sloping ridge back slopes interspersed with rocky escarpments; slopes smooth and roughly parallel to the sedementary rock beds.

H_{57}		40% Bittercreek Loam/30% Haterton Loam AAP: 7-9" AAAT: 40-45°F Gently sloping and sloping upland plans and pediments; slopes are smooth
H_{58}		90% Goslin with 10% inclusion, Fine Sandy Loam AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days Deep, well drained soil on nearly level to sloping alluvial fans and terraces, slopes are smooth.
H_{59}		45% Spool Loamy Sand/30% Rock Outcrop AAP: 10-14" AAAT: 25-40°F AFFP: 60-90 days
H_{60}	3/4	50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
	1/4	60% Dines Silt Loam/30% Dines Silt Loam Overflow AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level alluvial fans and bottomlands. Slopes smoth except where cut by gullies.
H_{61}		50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
H_{62}		60% Geagulf Fine Sandy Loam/20% Pepal Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level to sloping residual uplands; slopes are smooth.

Appendix 7. Soils and climate data for the prairie dog colonies sampled.

AAP: Average annual precipitation (inches)

AAAT: Average annual air temperature (°F)

AFFP: Average frost-free period (days)

Fractions (e.g. 3/4, 1/4) indicate that the transect covered more than one soil type and that fraction of the transect was in the corresponding soil type.

Location		Description
S_1		50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
	3/4	Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
		60% Dines Silt Loam/30% Dines Silt Loam Overflow AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level alluvial fans and bottomlands. Slopes smoth except where cut by gullies.
S_2		60% Dines Silt Loam/30% Dines Silt Loam Overflow AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.
S_3		50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
S^4		60% Dines Silt Loam/30% Dines Silt Loam Overflow AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.
S_5		Dines Silt Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.
S_6		Grieves Sandy Loam AAP: 10-14" AAAT: 35-40°F AFFP: 60-90 days
S_7		Dinco Very Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Deep, well drained soil on nearly level alluvial fans and bottomland; slopes smooth with some gullies.
S_8		25% Kandaly Loamy Fine Sand/25% Rock Outcrop/25% Winton Channery Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
	1/3	Gently sloping and undulating to hilly residual uplands cut by short, steep escarpments; slopes smooth with irregular dissected areas.
	1/3	50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
	1/3	60% Dines Silt Loam/30% Dines Silt Loam Overflow AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.
S_9		50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.

S_{10} Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

S_{11} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
3/4 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.
50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
1/4 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.

S_{12} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

S_{13} 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
1/2 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular
50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
1/2 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.

S_{14} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

S_{15} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

S_{16} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

S_{17} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

S_{18} 35% Horsley Loam/25% Haterton Alkaline Loam/20% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Rolling to hilly uplands; slopes are complex.

S_{19} 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular
Thayer Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

Dinco Very Fine Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level alluvial fans and bottomland; slopes smooth with some gullies.

S_{20} 60% Teagulf Fine Sandy Loam/20% Pepal Fine Sandy Loam
1/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level to sloping residual uplands; slopes are smooth.
40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
2/3 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular

S_{21} Dines Silt Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.

S_{22} 60% Geagulf Fine Sandy Loam/20% Pepal Fine Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level to sloping residual uplands; slopes are smooth.

S_{23} Dines Silt Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.

S_{24} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

S_{25} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

S_{26} 40% Horsley Silty Clay Loam/20% Huguston Sandy Loam/20% Rock Outcrop
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Moderately steep and hilly residual uplands over shale and sandstone bedrock

S_{27} 60% Geagulf Fine Sandy Loam/20% Pepal Fine Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level to sloping residual uplands; slopes are smooth.

S_{28} 50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.

S_{29} 50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.

S_{30} 40% Horsley Silty Clay Loam/20% Huguston Sandy Loam/20% Rock Outcrop
3/4 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Moderately steep and hilly residual uplands over shale and sandstone bedrock

S_{30} 50% Huguston Sandy Loam/25% Teagulf Fine Sandy Loam
1/8 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Gently sloping to sloping residual uplands predominantly over sandstone bedrock; slopes are smooth.
Thayer Sandy Loam
1/8 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

S_{31} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
3/4 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.
Thayer Sandy Loam
1/16 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.
Monte Clay Loam; Strongly Alkaline
1/16 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on alluvial fans and bottomlands
2/16 Dines Silt Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.

S_{32} 60% Dines Silt Loam/30% Dines Silt Loam Overflow
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Nearly level alluvial fans and bottom lands. Slopes smooth except where cut by gullies.

S_{33} Dines Silt Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.

S_{34} No available data.

S_{35} No available data.

S_{36} Dines Silt Loam
1/2 AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on flood plans and alluvial fan toe slopes; slopes smooth except for steep-sided gullies.
1/2 40% Huguston Sandy Loam/20% Rock Outcrop/20% Terada Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands on sandstone formations; slopes are irregular

S_{37} 40% Boltus Silty Clay/40% Horsley Silty Clay Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Rolling to hilly residual uplands; slopes are smooth.

S_{38} 40% Bittercreek Loam/30% Haterton Loam
AAP: 7-9" AAAT: 40-45°F
Gently sloping and sloping upland plans and pediments; slopes are smooth

S_{39} Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

S_{40} Thayer Sandy Loam
AAP: 7-9" AAAT: 40-45°F AFFP: 90-120 days
Deep, well drained soil on nearly level to gently sloping alluvial fans; slopes are smooth.

Appendix 8. Transect Data

Appendix 8A

MIXED CONIFER

Common Name	Transect Number 128	310	38a	36	320	$\bar{x}$
Goshawk		0.13				
Mourning Dove		0.27	0.33*	0.33	0.07*	x
Saw-whet Owl	0.03*					0.20
White-throated Swift	0.50					x
Broad-tailed Hummingbird		0.07*				x
Common Flicker			0.53			x
Hairy Woodpecker					0.73	x
Hammond's Flycatcher				0.07*		x
Western Flycatcher		0.53		0.07*		x
Western Wood Pewee	0.33					x
Olive-sided Flycatcher	0.03*					x
Violet-green Swallow	0.07*		0.20		0.13	+
Barn Swallow	0.30*					x
Clark's Nutcracker	0.07*	0.37	0.20	0.20	0.67	0.30
Black-capped Chickadee		0.53		0.53		0.21
Mountain Chickadee		0.13	1.07	0.47	1.27	0.59
Red-breasted Nuthatch	0.60	0.07*	0.67	0.33	0.87	0.51
Brown Creeper		0.13	0.13		0.27	0.11
Rock Wren	0.33					x
American Robin		0.07*	0.60	0.07*	0.40	0.23
Hermit Thrush	0.13	0.40	0.33	0.67		0.31
Mountain Bluebird	0.07*		0.40	0.07*	0.20	0.15
Townsend's Solitaire			0.13*			x
Ruby-crowned Kinglet		0.33	0.27	0.20*	0.07*	0.17
Warbling Vireo	0.03*			0.07*		x
Orange-crowned Warbler		0.07*				x
Yellow-rumped Warbler	0.03*	0.07*	0.53	0.20	0.40	0.25
MacGillivray's Warbler		0.27				x
Wilson's Warbler	0.07*					x
American Redstart	0.03*					x
Western Tanager		0.33				x
Purple Finch		0.13				x
Cassin's Finch		0.27	0.20	0.07*	0.13*	0.13
Pine Siskin	0.10	0.20	2.27	0.73	0.20	0.70
Green-tailed Towhee	0.23	0.33	0.07*			0.13
Gray-headed Junco	0.17	1.00	1.20	0.93	1.47	0.95
Chipping Sparrow		0.13			0.27	x
White-crowned Sparrow			0.40			x
Species Richness (n = 38)	18	22	18	16	15	
D Total	2.85	5.83	9.53	5.01	7.15	
Diversity Index	2.41	2.81	2.53	2.42	2.35	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

LIMBER PINE

Common Name	Transect Number 72	126	57	114	$\bar{x}$
Golden Eagle	0.07*				x
Red-tailed Hawk				0.07*	x
American Kestrel			0.20		x
Mourning Dove		0.10			x
Great Horned Owl			0.03*		x
Common Flicker		0.13	0.03*	0.13	+
Western Flycatcher			0.03*		x
Olive-sided Flycatcher			0.03*		x
Empidonax sp.			0.03*		x
Horned Lark				0.40	0.10
Violet-green Swallow		0.23		0.20*	x
Pinyon Jay	0.60*	0.57			0.29
Clark's Nutcracker	0.13*		0.17	0.53	0.21
Red-breasted Nuthatch		0.07	0.07*		x
Rock Wren	0.33	0.23	0.37	0.67	0.40
Sage Thrasher				0.07*	x
American Robin			0.13	0.27	0.10
Mountain Bluebird	0.27	0.30	0.30	0.53	0.35
Golden-crowned Kinglet	0.07*				x
Black-throated Gray Warbler		0.03*			x
Western Tanager		0.03*			x
House Finch		0.13			x
Green-tailed Towhee	0.27		0.23	0.27	0.19
Chipping Sparrow			0.10		x
Species Richness (n = 24)	7	10	13	11	
D Total	1.74	1.85	1.72	2.94	
Diversity Index	1.71	1.96	2.32	1.68	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8C

JUNIPER

Common Name	Transect Number 302	20a	77	14	52	$\bar{x}$
Accipiter sp.			0.07*	0.10		x
Red-tailed Hawk			0.07*			x
Ferruginous Hawk			0.07*			x
American Kestrel					0.03*	x
Mourning Dove	1.60	0.27	0.60	0.47	0.33	0.65
Common Nighthawk					0.20	x
Common Flicker					0.03*	x
Ash-throated Flycatcher	0.27*					x
Gray Flycatcher	0.27	0.93	0.47	0.13	0.03*	0.37
Western Flycatcher				0.07		x
Western Wood Pewee				0.03*		x
Violet-green Swallow			0.13	0.13		x
Rough-winged Swallow			0.07*			x
Black-billed Magpie					0.30	x
Pinyon Jay	0.40		0.13	0.10		0.13
Clark's Nutcracker					0.03*	x
Plain Titmouse		0.07*			0.07*	x
Bewick's Wren	0.53	1.07	0.13*	0.10	0.03*	0.37
Rock Wren			0.33	0.10		x
Sage Thrasher			0.27	0.03*		x
American Robin	0.07*		0.07*	0.03*	0.20	+
Mountain Bluebird	0.07*	1.00	0.80	0.33	0.93	0.63
Blue-gray Gnatcatcher		0.13		0.07*	0.03*	+
Common Starling			0.07*	0.03*		x
Black-throated Gray Warbler	0.13*	0.47		0.13		0.15
Brewer's Blackbird		0.20			0.03*	x
Brown-headed Cowbird			0.07*	0.07*		x
Western Tanager				0.03*		x
Lark Bunting			0.53*			x
House Finch			0.93	0.47	0.10	0.30
Green-tailed Towhee			0.87	0.20		x
Sage Sparrow			0.20*	0.10		x
Chipping Sparrow	0.40	0.33	0.53	0.30	0.17	0.35
Brewer's Sparrow		0.07*	0.47	0.07		0.12
Species Richness (n = 34)	9	10	21	22	15	
D Total	3.74	4.54	6.88	3.06	2.51	
Diversity Index	1.76	1.96	2.68	2.75	2.07	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8D

MOUNTAIN SHRUB

Common Name	Transect Number 341	336	12a	37	4	318	$\bar{x}$
Red-tailed Hawk				0.13*	0.13*		x
Golden Eagle		0.03*	0.03*				x
American Kestrel				0.07*			x
Mourning Dove	1.87				0.27		x
Common Nighthawk						0.07*	x
Broad-tailed Hummingbird			0.23				x
Common Flicker		0.17	0.03*				x
Yellow-bellied Sapsucker	0.93						x
Western Kingbird			0.07*				x
Dusky Flycatcher				0.07*			x
Western Flycatcher			0.10				x
Empidonax sp.		0.07	0.07				x
Horned Lark	0.40	0.17*					x
Violet-green Swallow		0.27					x
Black-billed Magpie		0.07					x
Clark's Nutcracker		0.07*	0.07*				x
Black-capped Chickadee			0.27*				x
Mountain Chickadee			0.13				x
House Wren		0.07*	0.03*	0.27			+
Rock Wren		0.03*			0.27	0.13	+
Sage Thrasher					0.40		x
American Robin	0.13*	0.03*	0.13	0.13	0.67		0.18
Mountain Bluebird	1.60	0.07*				0.33*	0.33
Warbling Vireo			0.23	0.47			0.12
Orange-crowned warbler			0.03*	0.53			x
Virginia's Warbler				0.20			x
Yellow Warbler		0.03*					x
MacGillivray's Warbler		0.43	0.70	2.27			0.62
Brewer's Blackbird	0.27*	0.23		0.07*			+
Brown-headed Cowbird				0.07*			x
Black-headed Grosbeak				0.07*			x
Cassin's Finch			0.07				x
Green-tailed Towhee	1.87	1.53	0.50	1.07	0.67	0.60	1.04
Vesper Sparrow		0.03					x
Sage Sparrow				0.07*			x
Gray-headed Junco			0.07*				x
Chipping Sparrow						0.67	0.11
Brewer's Sparrow		0.27		0.07*	3.33		0.61
White-crowned Sparrow					0.93		x
Song Sparrow				0.27*			x
Species Richness (n = 40)	7	17	17	16	8	5	
D Total	7.07	3.57	2.76	5.83	6.67	1.80	
Diversity Index	1.67	2.06	2.37	2.04	1.59	1.36	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8E

SALTBUSH-GREASEWOOD

Common Name	Transect Number 339	90	331	58a	301a	122	$\bar{x}$
Marsh Hawk			0.03*				x
American Kestrel	0.06*						x
Killdeer		0.03*					x
Mourning Dove		0.07*				0.20*	x
Common Flicker					0.03*	0.07*	x
Say's Phoebe						0.13*	x
Horned Lark			0.43				x
Violet-green Swallow	0.20*					0.13*	x
Pinyon Jay						0.13*	x
Black-billed Magpie			0.03*				x
Sage Thrasher	0.27	0.13	0.20	0.23	0.10		0.16
Mountain Bluebird						0.13*	x
Loggerhead Shrike	0.13			0.20		0.27	0.10
Brewer's Blackbird		0.33					x
Brown-headed Cowbird		0.07*					x
Green-tailed Towhee					0.10	0.27	x
Sage Sparrow				0.33	0.07	0.73	0.19
Chipping Sparrow						0.07*	x
Brewer's Sparrow	1.60	0.70	0.67	0.23	1.10	3.00	1.22
Lincoln's Sparrow					0.10		x
Song Sparrow		0.57	0.07*				0.11
Species Richness (n=21)	5	7	6	4	6	11	
D Total	2.26	1.90	1.43	0.99	1.50	5.13	
Diversity Index	0.97	1.52	1.30	1.37	0.99	1.52	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8F

BASIN BIG SAGEBRUSH

Common Name	Transect Number 33	112	303	$\bar{x}$
Marsh Hawk			0.07*	x
Mourning Dove			0.13*	x
Say's Phoebe	0.07*	0.13		+
Horned Lark	0.07*		0.20*	+
Violet-green Swallow		0.13		x
Black-billed Magpie	2.93			0.97
Black-capped Chickadee	0.13*			x
Rock Wren	0.07*			x
Sage Thrasher		0.33	0.47	0.27
American Robin	0.20			x
Mountain Bluebird		0.07*		x
Brewer's Blackbird		0.40		0.13
Brown-headed Cowbird			0.07*	x
Green-tailed Towhee	0.53	0.67	1.00	0.73
Sage Sparrow	0.13		0.40	0.18
Brewer's Sparrow	3.06	1.73	1.80	2.19
Song Sparrow		0.47		0.16
Species Richness (N=17)	9	8	8	
D Total	7.19	3.93	4.14	
Diversity Index	1.30	1.64	1.56	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8G

BIG SAGEBRUSH-GRASS

Common Name	Transect Number 59	118	119	300	332	$\bar{x}$
Ferruginous Hawk			0.03*			x
American Kestrel		0.03*				x
Mourning Dove		0.10			0.07*	x
Say's Phoebe		0.07	0.03*			x
Horned Lark	0.43		0.20	0.20		0.17
Violet-green Swallow	0.03*	0.03*		0.03*		+
Rough-winged Swallow				0.07*		x
Barn Swallow				0.17	0.03*	x
Black-billed Magpie			0.03*			x
Pinyon Jay		0.17*				x
Rock Wren		0.17				x
Sage Thrasher	0.07	0.07	0.20	0.07*	0.03*	+
American Robin		0.07			0.03*	x
Mountain Bluebird		0.23			1.10	0.22
Western Meadowlark			0.03*			x
Brewer's Blackbird				0.03*		x
Green-tailed Towhee		0.20		0.07*	0.37	0.13
Vesper Sparrow			0.07	0.27	0.10*	+
Lark Sparrow				0.07*		x
Sage Sparrow	0.37		0.63	0.83	0.30	0.43
Brewer's Sparrow	0.56	0.30	0.50	0.67	0.40	0.49
Song Sparrow				0.56	0.13	0.14
Species Richness (n=22)	5	11	9	12	10	
D Total	1.46	1.44	1.72	3.04	1.56	
Diversity Index	1.30	2.04	1.64	1.99	1.93	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8H

HIGHLAND SAGEBRUSH-GRASS

Common Name	Transect Number 85a	306	319a	327	$\bar{x}$
Mourning Dove			0.07*		x
Horned Lark	2.03	1.17	0.57	0.57	1.08
Clark's Nutcracker				2.07	0.52
Sage Thrasher		0.03*			x
American Robin		0.03*	0.23	0.07*	+
Mountain Bluebird			0.23	0.13*	+
Species Richness (n=6)	1	3	4	4	
D Total	2.03	1.23	1.10	2.84	
Diversity Index	0.00	0.23	1.17	0.79	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8I

ASPEN

Common Name	Transect Number 111	335	35	6	316	371	$\bar{x}$
Red-tailed Hawk	0.07*						x
American Kestrel						0.33*	x
Mourning Dove	0.67	0.07*	0.07*		0.20	1.33	0.39
Black-billed Cuckoo						0.07*	x
Great Horned Owl						0.17*	x
Poor-will	0.07*						x
Common Nighthawk		0.07*					x
White-throated Swift					0.13*		x
Common Flicker	0.07*	0.13*	0.27	0.27	0.03*	0.17	0.16
Hairy Woodpecker		0.07*	0.20		0.03*		+
Eastern Kingbird	0.13*						x
Cassin's Kingbird					0.03*		x
Say's Phoebe	0.20						x
Hammond's Flycatcher				0.07*			x
Dusky Flycatcher				0.53		0.83	0.27
Gray Flycatcher	0.33						x
Empidonax sp.	0.13	0.20	0.07*	0.27	0.57		0.21
Western Wood Pewee	0.20		0.07*				x
Olive-sided Flycatcher	0.07*						x
Horned Lark				0.07*			x
Violet-green Swallow	2.33		0.40		0.70	0.67*	0.68
Tree Swallow		0.27	0.07*				x
Black-billed Magpie					0.03*		x
Clark's Nutcracker	0.07*		0.07*		0.03*		+
Black-capped Chickadee		0.27		0.13			x
Mountain Chickadee		0.27		0.07*			x
Red-breasted Nuthatch	0.20			0.13*	0.03*		+
House Wren	0.07*	2.53		0.53		2.00	0.86
Rock Wren	0.07*			0.13			x
American Robin	1.00	0.53	1.40	1.40	0.50	2.83	1.28
Hermit Thrush			0.53				x
Mountain Bluebird	0.20	0.53	0.20	0.53		0.07*	0.26
Townsend's Solitaire	0.07*						x
Cedar Waxwing						0.17*	x
Starling						0.83	0.13
Warbling Vireo	0.73	1.13	0.40	0.47	0.67	0.83	0.70
Orange-crowned Warbler		0.07*			0.13		x
Yellow Warbler				0.07*			x
Yellow-rumped Warbler		0.40	0.07*	0.40	0.10		0.16
MacGillivray's Warbler		0.20			0.03*	0.50	0.12
Brewer's Blackbird	0.47					0.17*	0.11
Brown-headed Cowbird	0.13*					0.83	0.16
Western Tanager	0.20*						x
Purple Finch		0.20	1.07			0.07*	0.22
Pine Siskin					0.07*		x
Green-tailed Towhee	0.40	0.40		0.60	0.47		0.31

Gray-headed Junco	0.07*	0.13*	2.60	0.93	0.03*		0.63
Brewer's Sparrow	0.20						x
White-crowned Sparrow		0.13*	0.07*	0.20			+
Song Sparrow					0.03*		x
Species Richness (n=50)	25	19	16	17	17	17	
D Total	8.15	7.60	7.56	6.73	3.75	11.87	
Diversity Index	2.50	2.36	2.07	2.50	2.27	2.36	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8J

RIPARIAN FOREST

Common Name	Transect Number 309a	321a	311a	329	$\bar{x}$
Merlin	0.07*				x
American Kestrel			0.04*		x
Mourning Dove	0.80	0.27	0.27		0.34
Black-billed Cuckoo				0.13*	x
Broad-tailed Hummingbird		0.40	0.44		0.21
Common Flicker	1.04	0.93	0.62	0.53	0.78
Yellow-bellied Sapsucker			0.04*		x
Eastern Kingbird				0.53	0.13
Dusky Flycatcher			0.13		x
Western Flycatcher		0.27*			x
Western Wood Pewee	0.53				0.13
Empidonax sp.	0.33	1.33			0.41
Violet-green Swallow	0.13*	1.07	0.04*	0.13*	0.34
Tree Swallow	0.20		0.04*		+
Black-billed Magpie				0.27*	x
Clark's Nutcracker			0.04*		x
Black-capped Chickadee			0.04*	0.67	0.18
House Wren	1.07	4.53	0.53	1.07	1.80
American Robin	1.80	1.20	0.84	2.93	1.69
Hermit Thrush				0.27	x
Mountain Bluebird	0.47	0.53	0.36		0.34
Starling	0.40		0.40	0.40	0.30
Warbling Vireo	0.47	1.60	0.04*	0.67	0.69
Yellow Warbler	0.93			0.53	0.37
McGillivray's Warbler	0.20	0.13*	0.93	0.67	0.48
Brewer's Blackbird	0.93	0.13*	0.09*	1.20	0.59
Brown-headed Cowbird	0.60			0.13*	0.18
Purple Finch	0.67	1.47			0.54
Pine Siskin	0.13*				x
Lesser Goldfinch		0.13*			x
Green-tailed Towhee	0.47	0.67		0.67	0.45
Chipping Sparrow		0.13*			x
Brewer's Sparrow		0.27*			x
White-crowned Sparrow	2.33				0.58
Fox Sparrow	0.13				x
Song Sparrow	0.93	0.80	0.80	7.20	2.43
Species Richness (n=36)	22	18	18	17	
D Total	14.99	14.26	5.69	18.00	
Diversity Index	2.78	2.57	2.42	2.13	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8K

RIPARIAN SHRUB

Common Name	Transect Number 337	307a	312	$\bar{x}$
Mallard	0.07*			x
Red-tailed Hawk	0.07*			x
Marsh Hawk	0.07*			x
Sage Grouse	0.20			x
Killdeer	0.27			x
Mourning Dove	0.53		0.53	0.35
Great Horned Owl			0.13	x
Long-eared Owl	0.27*			x
Broad-tailed Hummingbird		0.47		0.16
Common Flicker	0.20	0.07*	0.93	0.40
Western Wood Pewee			0.13*	x
Violet-green Swallow	0.13	0.27		0.13
Tree Swallow		0.13		x
Rough-winged Swallow	0.13			x
Barn Swallow	0.07*		0.13*	+
Black-billed Magpie	0.33		0.40	0.24
Dipper		0.13*		x
House Wren		0.40		0.13
American Robin	0.13*	0.47	2.13	0.91
Mountain Bluebird	0.13*	0.07*	0.40	0.20
Cedar Waxwing		0.13*		x
Common Starling			0.53	0.18
Warbling Vireo			0.27	x
Yellow Warbler	1.13	1.27		0.80
MacGillivray's Warbler		1.47		0.49
Yellow-breasted Chat		0.20		x
Brewer's Blackbird	1.40	0.33	1.33	1.02
Brown-headed Cowbird	0.20		0.27*	0.16
Green-tailed Towhee	0.60	0.53		0.38
Vesper Sparrow	0.07*			x
Brewer's Sparrow	0.47			0.16
White-crowned Sparrow	1.53		0.27*	0.60
Fox Sparrow	1.87		0.40	0.76
Song Sparrow	0.67	2.40	1.47	1.51
Species Richness (n=34)	23	15	15	
D Total	10.54	8.34	9.32	
Diversity Index	2.57	2.20	2.35	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8L

RIPARIAN MEADOW

Common Name	Transect Number 86a	92	308a	$\bar{x}$
Marsh Hawk		0.13		x
Killdeer			0.13	x
Mourning Dove		0.03*	0.03*	+
Horned Lark			0.03*	x
Violet-green Swallow	0.07*			x
Black-billed Magpie	0.07*	0.03*		+
American Robin	0.07*		0.10	+
Starling			0.33*	x
Western Meadowlark	0.27	0.03*	0.07	0.12
Yellow-headed Blackbird		0.13		x
Red-winged Blackbird	0.47	0.03*	0.47	0.32
Brewer's Blackbird	0.53	0.43	0.73	0.56
Western tanager		0.03*		x
Rose-breasted Grosbeak		0.03*		x
Lazuli Bunting	0.07*			x
Savannah Sparrow		0.33		0.11
Vesper Sparrow		0.10		x
Brewer's Sparrow		0.03*		x
Song Sparrow	0.07*		0.20	+
Species Richness (n=19)	8	12	9	
D Total	1.62	1.33	2.09	
Diversity Index	1.70	1.96	1.77	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8M

MOUNTAIN MEADOW

Common Name	Transect Number 317a	340	40a	334	$\bar{x}$
American Kestrel				0.03*	x
Mourning Dove	0.03*		0.07*		+
Horned Lark	0.70	0.30	0.67	1.10	0.69
Violet-green Swallow			0.03*		x
Black-billed Magpie	0.03*				x
Clark's Nutcracker				1.43	0.36
Rock Wren			0.07		x
American Robin			0.07*	0.07*	+
Mountain Bluebird	0.40		0.07*	0.33	0.20
Brewer's Blackbird		1.03			0.26
Vesper Sparrow		0.03*	0.07		+
Species Richness (n=11)	4	3	7	5	
D Total	1.16	1.36	1.05	2.96	
Diversity Index	0.86	0.63	1.29	1.10	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8N

BADLANDS

Common Name	Transect Number 304	305	328	55a	$\bar{x}$
Golden Eagle				0.03*	x
Mourning Dove	0.13		0.17		+
Common Flicker			0.23		x
Say's Phoebe	0.10				x
Horned Lark	0.33	0.30		0.60	0.31
Violet-green Swallow			0.23		x
Rock Wren	0.20	0.03*	0.33		0.14
Sage Thrasher	0.07*				x
American Robin			0.03*		x
Mountain Bluebird	0.07	0.07*	0.33	0.03*	0.13
Loggerhead Shrike		0.03*			x
Green-tailed Towhee	0.07		0.27		+
Sage Sparrow	0.07*	0.20			+
Brewer's Sparrow	0.13		0.23		+
Species Richness (N=14)	9	5	8	3	
D Total	1.17	0.63	1.82	0.66	
Diversity Index	2.03	1.25	1.97	0.37	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

OUTCROP

Common Name	Transect Number 338	74	110	29a	$\bar{x}$
American Kestrel		0.13			x
Killdeer	0.07*				x
Mourning Dove			0.03*	0.07*	+
Great Horned Owl			0.03*		x
Say's Phoebe		0.20*	0.03*		+
Horned Lark	0.47				0.12
Violet-green Swallow	0.40	0.13*	0.10		0.16
Black-billed Magpie		0.07*	0.10		+
Pinyon Jay				0.52	0.13
Brown Creeper				0.07*	x
Bewick's Wren				0.37	x
Rock Wren	0.20	0.27	0.20	0.59	0.32
American Robin			0.07*	0.22	+
Mountain Bluebird	0.07*		0.20		+
MacGillivray's Warbler			0.03*		x
Wilson's Warbler			0.03*		x
Brewer's Blackbird				0.29*	x
Brown-headed Cowbird			0.10		x
Green-tailed Towhee			0.27		x
Vesper Sparrow				0.07*	x
Sage Sparrow		0.07*	0.10	0.07*	+
Chipping Sparrow			0.03*	0.07*	+
Species Richness (n=22)	5	6	14	10	
D Total	1.21	0.87	1.32	0.94	
Diversity Index	1.36	1.67	2.35	2.66	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 8P

DUNE

Common Name	Transect Number 65	70	313	314	$\bar{x}$
Pintail		0.07			x
Marsh Hawk	0.07*				x
Prairie Falcon				0.10	x
Killdeer			0.13	0.03*	+
Horned Lark	0.77	0.40	0.27	0.43	0.47
Brewer's Blackbird			0.13*		x
Vesper Sparrow		0.07	0.13*		+
Sage Sparrow	0.03*				x
Species Richness (n=8)	3	3	4	3	
D Total	0.87	0.54	0.66	0.56	
Diversity Index	0.42	0.75	1.33	0.67	

Table values are estimated number of birds per hectare.
Asterisks refer to species represented in only one of three replicates per transect sampling.

Appendix 9. Bird species (n=117) occurrence in sixteen standard habitat types.

Common Name	Status	Mixed Conifer	Limber Pine	Juniper	Mountain Shrub	Saltbush-Greasewood	Basin Big Sagebrush	Big Sagebrush-Grass	Highland Sagebrush-Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrops	Sand Dunes
Mallard										X	•	X				X	
Cadwall										X							
Pintail																•	
Green-winged teal											X						
Ring-necked Duck										X							
Turkey Vulture										X							
Goshawk		•															
Cooper's Hawk		X								X							
Accipiter sp.				•													
Red-tailed Hawk		X	•	•	•				•	X	•						
Ferruginous Hawk	FHI		X	•			X	•						X			
Colden Eagle	FHI	X	•		•	X		X				X		•	X		
Marsh Hawk						•	•				•	•				•	
Prairie Falcon	FHI	X	X			X								X		•	
Merlin	UC,UD									•							
American Kestrel			•	•	•	•		•	X	•	•		•		•		
Sage Grouse	SHI						X		X		•			X			
Ring-necked Pheasant								X									
American Coot																X	
Killdeer						•					•	•			•	•	
Long-billed Curlew																X	
Spotted Sandpiper																X	
Solitary Sandpiper											X						
Wilson's Phalarope																X	
Mourning Dove		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Black-billed Cuckoo	UC,UD								•	•							
Great Horned Owl		X	•	X		X		X	•		•				•		
Long-eared Owl											•						
Saw-whet Owl		•															
Poor-will		X	X						•		X						
Common Nighthawk		X		•	•				•					X			
White-throated Swift		•							•								
Broad-tailed Hummingbird		•			•					•	•						
Common Flicker		•	•	•	•	•		X	•	•	•			•	X		
Yellow-bellied Sapsucker					•					•							
Hairy Woodpecker		•							•								
Eastern Kingbird									•	•							
Western Kingbird					•												
Cassin's Kingbird									•								
Ash-throated Flycatcher				•													
Say's Phoebe						•	•	•	•					•	•		
Hammond's Flycatcher		•							•								
Dusky Flycatcher					•				•	•							

Common Name	Status	Mixed Conifer	Limber Pine	Juniper	Mountain Shrub	Saltbush-Greasewood	Basin Big Sagebrush	Big Sagebrush-Grass	Highland Sagebrush-Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrops	Sand Dunes
Gray Flycatcher			•						•								
Western Flycatcher		•	•	•	•					•							
Empidonax sp.			•		•		X		•	•							
Western Wood Pewee		•		•					•	•	•						
Olive-aided flycatcher		•	•						•								
Horned Lark			•		•	•	•	•	•	•			•	•	•	•	•
Violet-green Swallow		•	•	•	•	•	•	•		•	•	•	•	•	•	•	
Tree Swallow										•	•	•					
Rough-winged Swallow				•				•				•					
Barn Swallow		•				X		•				•				X	X
Cliff Swallow													X				
Black-billed Magpie				•	•	•	•	•		•	•	•	•	•		•	
Pinyon Jay			•	•		•		•								•	
Clark's Nutcracker		•	•	•	•	X			•	•	•			•			
Black-capped Chickadee		•			•		•			•	•	X					
Mountain Chickadee		•			•					•							
Plain Titmouse				•													
Red-breasted Nuthatch		•	•							•						X	
Brown Creeper		•														•	
Dipper												•					
House Wren					•			•			•	•					
Bewick's Wren	SHI			•												•	
Rock Wren		•	•	•	•	X	•			•	X			•	•	•	
Gray Catbird			X														
Sage Thrasher			•	•	•	•	•	•	•						•	X	
American Robin		•	•	•	•		•	•	•	•	•	•	•	•	•	•	
Hermit Thrush		•								•	•						
Mountain Bluebird		•	•	•	•	•	•	•	•	•	•	•		•	•	•	
Townsend's Solitaire		•								•							
Blue-gray Gnatcatcher				•													
Golden-crowned Kinglet		X	•														
Ruby-crowned Kinglet		•		X													
Cedar Waxwing										•		•					
Loggerhead Shrike						•								•			
Starling				•		X				•	•	•	•				
Warbling Vireo		•			•					•	•	•					
Orange-crowned Warbler		•			•					•							
Virginia's Warbler					•												
Yellow Warbler					•					•	•	•					
Yellow-rumped Warbler		•			•					•						X	
Black-throated Gray Warbler			•	•													
MacGillivray's Warbler		•								•	•	•				•	
Yellow-breasted Chat												•					
Wilson's Warbler		•						X								•	

Common Name	Status	Mixed Conifer	Limber pine	Juniper	Mountain Shrub	Saltbush-Greasewood	Basin Big Sagebrush	Big Sagebrush-Grass	Highland Sagebrush-Grass	Aspen	Riparian Forest	Riparian Shrub	Riparian Meadow	Mountain Meadow	Badlands	Outcrops	Sand Dunes
American Redstart		•															
Western Meadowlark						X		•				•					
Yellow-headed Blackbird												•					
Red-winged Blackbird										X		•					
Scott' Oriole			X														
Brewer's Blackbird			•	•	•	•	•		•	•	•	•	•		•	•	
Brown-headed Cowbird			•	•	•	•			•	•	•				•		
Western Tanager		•	•	•					•			•					
Rose-breasted Grosbeak												•					
Black-headed Grosbeak				•													
Lazuli Bunting								X				•					
Purple Finch		•							•	•							
Cassin's Finch		•		•													
House Finch			•	•													
Pine Siskin		•							•	•							
Lesser Goldfinch										•							
Red Crossbill		X	X														
Green-tailed Towhee		•	•	X	•	•	•	•	•	•	•			•	•		
Lark Bunting				•													
Savannah Sparrow												•					
Vesper Sparrow					•			•			•	•	•		•	•	
Lark Sparrow								•									
Sage Sparrow				•	•	•	•	•						•	•	•	
Dark-eyed Junco									X								
Gray-headed Junco		•		•	•				•								
Chipping Sparrow		•	•	•	•	•		X		•	X				•		
Brewer's Sparrow				•	•	•	•	•	•	•	•	•		•			
White-crowned Sparrow		•			•				•	•	•	X					
Fox Sparrow										•	•						
Lincoln's Sparrow						•											
Song Sparrow					•	•	•	•	•	•	•	•					
McCown's Longspur								X									

Status: FHI = Federal species of high interest
UC = State considers occurrence uncommon
X = Species observed in area but not recorded during transect sampling
SHI = State species of high interest
UD = State considers status undetermined
• = Species recorded during transect sampling

Appendix 10 Weights and references used in calculating bird species biomass estimates.

Species	Wt. (g)	References
Mourning Dove	134	Ivacic and Labisky 1973
Broad-tailed Hummingbird	3	estimated
Black-billed Cuckoo	61	Poole 1938 (Yellow-billed =)
Common Flicker	100	Poole 1938
Eastern Kingbird	178	Wetherbee
Say's Phoebe	28	Behle 1944
Dusky Flycatcher	12	estimated
Gray Flycatcher	12	Schoener 1968
Empidonax sp.	10	estimated
Western Wood Peewee	13	Broun 1933
Horned Lark	26	Trost 1972
Violet-green Swallow	15	estimated
Barn Swallow	17	Poole 1938
Black-billed Magpie	170	Linsdale 1937
Pinyon Jay	108	Poole 1938
Clark's Nutcracker	130	Schoener 1968
Black-capped Chickadee	11	estimated
Mountain Chickadee	11	estimated
Red-breasted Nuthatch	11	Mugas & Templeton (1970)
Brown Creeper	8	Poole 1938
House Wren	10	Schoener 1968
Bewick's Wren	11	Schoener 1968
Rock Wren	17	Easterla 1973
Sage Thrasher	37	Killpak 1970
American Robin	79	Robbins (pers. comm.) in BLM (1979)
Hermit Thrush	27	Broun 1933
Mountain Bluebird	20	Power 1966
Blue-gray Gnatcatcher	8	estimated
Ruby-crowned Kinglet	6	Broun 1933
Loggerhead Shrike	51	Robbins (pers. comm.) in BLM (1979)
Starling	79	Robbins (pers. comm.) in BLM (1979)
Warbling Vireo	15	estimated
Yellow Warbler	10	Robbins (pers. comm.) in BLM (1979)
Yellow-rumped Warbler	11	Broun 1933
Black-throated Gray Warbler	9	estimated
MacGillivray's Warbler	11	estimated
Western Meadowlark	96	Balph 1973
Red-winged Blackbird	48	Robbins (pers. comm.) in BLM (1979)
Brewer's Blackbird	68	Porter and White 1973
Brown-headed Cowbird	41	Robbins (pers. comm.) in BLM (1979)
Purple Finch	22	estimated
Cassin's Finch	22	estimated
House Finch	22	Robbins (pers. comm.) in BLM (1979)
Pine Siskin	14	Whittle 1930
Green-tailed Towhee	30	estimated
Savannah Sparrow	24	estimated
Vesper Sparrow	26	Broun 1933
Sage Sparrow	24	Balph 1973

Species	Wt. (g)	References
Gray-headed Junco	22	estimated
Chipping Sparrow	12	Broun 1933
Brewer's Sparrow	11	estimated
White-crowned Sparrow	27	Morton *et al* 1973
Fox Sparrow	40	Whittle 1930
Song Sparrow	21	Baldwin and Kendeigh 1938

APPENDIX 11

Owl Pellet Analyses

Prey species in ten whole Great Horned Owl pellets and broken fragments found in mixed conifer bird transect No. 128.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	2	5	7	25.0
Nuttall Cottontail	1	-	1	3.6
Northern Pocket Gopher	2	1	3	10.7
Subfamily Cricetinae	6	-	6	21.4
Deer Mouse	-	1	1	3.6
Bushy-tailed Woodrat	-	2	2	7.1
Subfamily Microtinae	1	1	2	7.1
Sagebrush Vole	1	-	1	3.6
Darkling Beetles	-	1	1	3.6
Jerusalem Cricket	-	1	1	3.6
Unidentified Bird	-	1	1	3.6
TOTAL	14	14	28	100.0

Prey species in seventeen whole Great Horned Owl pellets and fragments found in limber pine bird transect No. 57, 16 May, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Unidentified Shrew	1	-	1	1.4
Order Lagomorpha	3	5	8	11.6
Nuttall Cottontail	1	-	1	1.4
Richardson Ground Squirrel	-	1	1	1.4
Northern Pocket Gopher	1	4	5	7.2
Ord Kangaroo Rat	-	1	1	1.4
Subfamily Cricetinae	3	10	13	18.9
Deer Mouse	1	3	4	5.8
Subfamily Microtinae	7	5	12	17.5
Sagebrush Vole	2	-	2	2.9
Montane Meadow Mouse	1	1	2	2.9
Long-tailed Weasel	-	1	1	1.4
Jerusalem Cricket	-	14	14	20.4
Grasshopper	-	2	2	2.9
Unidentified Bird	1	1	2	2.9
TOTAL	21	48	69	100.0

Prey species in two whole Great Horned Owl pellets found in juniper bird transect No. 52.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	1	-	1	33.3
Subfamily Cricetinae	1	-	1	33.3
Subfamily Microtinae	1	-	1	33.3
TOTAL	3	-	3	99.9

Prey species in 36 whole Great Horned Owl fragments found in juniper bird transect No. 77.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	12	12	24	21.0
Nuttall Cottontail	2	-	2	1.8
Richardson Ground Squirrel	1	-	1	0.9
Northern Pocket Gopher	2	2	4	3.5
Subfamily Cricetinae	12	12	24	21.0
Deer Mouse	1	2	3	2.6
Subfamily Microtinae	1	2	3	2.6
Sagebrush Vole	1	1	2	1.8
Montane Meadow Mouse	-	1	1	0.9
Scarab Beetles	-	1	1	0.9
Jerusalem Cricket	21	22	43	37.7
Scorpions	-	5	5	4.4
Unidentified Bird	-	1	1	0.9
TOTAL	53	61	114	100.0

Prey species in one broken Great Horned Owl found in juniper bird transect No. 20a.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	-	1	1	50.0
Subfamily Cricetinae	-	1	1	50.0
TOTAL	-	2	2	100.0

Prey species in five whole Great Horned Owl pellets and broken fragments found in juniper bird transect No. 302.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	2	4	6	35.3
Nuttall Cottontail	-	2	2	11.8
Subfamily Cricetinae	2	3	5	29.4
Deer Mouse	1	-	1	5.9
Bushy-tailed Woodrat	-	2	2	11.8
Subfamily Microtinae	1	-	1	5.9
TOTAL	6	11	17	100.0

Prey species in Great Horned Owl pellet fragments found in Pine Canyon adjacent to Saltbush-Greasewood Bird Transect No. 122, August 31, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	-	2	2	40.0
Richardson Ground Squirrel	-	1	1	20.0
White-tailed Prairie Dog	-	1	1	20.0
Bushy-tailed Woodrat	-	1	1	20.0
TOTAL	-	5	5	100.0

Prey species in five whole Burrowing Owl pellets and fragments collected on 10 May 1980 approximately 1.6 km west of Greasewood Reservoir.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Carrion Beetles	2	-	2	7.1
Scarab Beetles	1	-	1	3.6
Darkling Beetles	-	15	15	53.6
Jerusalem Cricket	-	1	1	3.6
Grasshoppers	9	-	9	32.1
TOTAL	12	16	28	100.0

Prey species in two whole Great Horned Owl pellets found in Aspen Bird Transect No. 335. July 15, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	1	-	1	33.3
Bushy-tailed Woodrat	1	-	1	33.3
Subfamily Microtinae	1	-	1	33.3
TOTAL	3	-	3	99.9

Prey species in nine whole long-eared owl pellets and fragments found in Riparian Shrub Bird Transect No. 337, July 19, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Unidentified Shrew	-	1	1	2.3
Northern Pocket Gopher	1	-	1	2.3
Olive-backed Pocket Mouse	2	-	2	4.5
Subfamily Cricetinae	6	3	9	20.4
Deer Mouse	4	3	7	15.9
Subfamily Microtinae	2	3	5	11.4
Sagebrush Vole	4	3	7	15.9
Unidentified beetle	1	-	1	2.3
Jerusalem Cricket	5	4	9	20.4
Ant	1	-	1	2.3
Unidentified Sparrow	-	1	1	2.3
TOTAL	26	18	44	100.0

Prey species in three whole Great Horned Owl pellets found in Badlands Bird Transect Nos. 304, 305, June 9, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	2	-	2	66 2/3
Jerusalem Cricket	1	-	1	33 1/3
TOTAL	3	-	3	100.0

Prey species in four whole Great Horned Owl pellets found in Outcrop Bird Transect No. 338. July 20, 1980.

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Deer Mouse	1	-	1	16.7
Subfamily Microtinae	4	-	4	66.6
Unidentified Bird	1	-	1	16.7
TOTAL	6	-	6	100.0

Prey species in five whole Great Horned Owl pellets and fragments found in Outcrop Bird Transect No. 110, May 19, 1980

Species	Number Prey Individuals from Whole Pellets	Number Prey Individuals from Broken Fragments	Total Number Prey Individuals	% of Diet
Order Lagomorpha	1	-	1	4.3
Nuttall Cottontail	-	4	4	17.5
White-tailed Prairie Dog	-	1	1	4.3
Northern Pocket Gopher	-	1	1	4.3
Subfamily Cricetinae	3	2	5	21.8
Deer Mouse	-	2	2	8.8
Bushy-tailed Woodrat	-	1	1	4.3
Subfamily Microtinae	1	-	1	4.3
Sagebrush Vole	1	-	1	4.3
Jerusalem Cricket	5	-	5	21.8
Unidentified Bird	1	-	1	4.3
TOTAL	12	11	23	100.0

Appendix 12 Forty-eight special habitat features identified in thirty-four bird transects.

Feature Description	Feature Code*	Habitat	Site	Location	Date Surveyed	Relation to Habitat Site**	Species	General Use	Specific Use
Cliff	A05	mountain meadow	T40a	Currant Creek Ranch SENW Sec. 20 T13N R105W	July 6, 1980	A	rock wren violet green swallow	breeding breeding	feeding area
Cliff	A05	mountain shrub	T336	Four J Rim SWSW Sec. 1 T12N R103W	July 17, 1980	A	golden eagle violet green swallow	- breeding	roost area active nest
Seep (2)	A12	juniper	T52	Horse Ranch SWNE Sec. 21 T14N R111W	July 20, 1980	W	-	-	-
Seep (2)	A12	badlands	T55a	Soap Holes Reservoir NWNE Sec. 33 T15N R112W	July 20, 1980	W	-	-	-
Seep (2)	A12	badlands	T55a	Soap Holes Reservoir NWNE Sec. 4 T14N R112W	July 20, 1980	W	-	-	-
Cold Spring	A13	outcrop	T110	Superior SENW Sec. 18 T21N R101W	June 2, 1980	W	MacGillivray's warbler Wilson's warbler	breeding breeding	feeding area feeding area
Cold Spring	A13	badlands	T304	Haystack Flats SWNW Sec. 18 T17N R95W	June 9, 180	A	great basin spadefoot	breeding	feeding area
Cold Spring (2)	A13	Aspen	T371	Superior SENE Sec. 10 T23N R102W	June 16, 1980	W	house wren MacGillivray's warbler black-billed cuckoo warbling vireo	- - - -	- - - -
Cold Spring	A13	big sagebrush-grass	T332	Superior SWNE Sec. 19 T21N R101W	June 17, 1980	A	violet green swallow American robin Say's phoebe Brewer's sparrow Lazuli bunting Wilson's warbler	- - - - - -	feeding area feeding area feeding area watering area feeding area feeding area
Cold Spring	A13	riparian forest	T309a	Maxon Ranch NWNW Sec. 32 T15N R104W	June 30, 1980	W	-	-	-
Group of snags	A15	riparian shrub	T312	Currant Creek Ranch NENW Sec. 20 T14N R105W	July 5, 1980	W	violet green swallow house wren common flicker tree swallow	breeding breeding breeding breeding	active nest active nest active nest active nest
Group of snags	A15	aspen	T35	Currant Creek Ranch	July 6, 1980	W	hairy woodpecker tree swallow	breeding bearing rearing young	feeding area feeding area
Group of snags	A15	riparian forest	T321a	Red Creek Ranch NWSW Sec. 12 T12N R104W	July 14, 1980	W	common flicker house wren	breeding bearing rearing young	active nest
Group of snags	A15	mixed conifer	T320	Red Creek Ranch NWSW Sec. 10 T12N R103W	July 17, 1980	W	hairy woodpecker brown creeper mountain bluebird mountain chickadee	- - breeding bearing rearing young	feeding area feeding area active nest active nest
Talus Slope (2)	A16	mixed conifer	T128	Pine Butte SWSW Sec. 33 T16N R100W	June 11, 1980	W	rock wren	breeding	feeding area
Beaver Dam	A25	riparian forest	T309a	Maxon Ranch NENW Sec. 32 T15N R104W	June 30, 1980	W	beaver	entire cycle	watering area escape cover resting area
Beaver Dam	A25	mountain shrub	T12a	Maxon Ranch NENW Sec. 33 T14N R105W	July 3, 1980	A	beaver	entire cycle	watering area escape cover resting area
Beaver Dam		riparian shrub	T312	Currant Creek Ranch NENW Sec. 20 T14N R105W	July 3, 1980	W	green-winged teal mallard solitary sandpaper	rearing young rearing young migration	active nest active nest feeding area
Temporary Pond	A32	saltbush-greasewood	T301a	Firehole Basin NWNE Sec. 4 T16N R106W	May 19, 1980	A	Great basin spadefoot	breeding, bearing young	feeding area
Small Natural Ponds	A33	sand dunes	T313	Boar's Tusk SENW Sec. 23 T23N R103W	May 22, 1980	W	great basin spadefoot blotched tiger salamander killdeer	breeding, bearing young bearing young	feeding area feeding area active nest

Feature Description	Feature Code*	Habitat	Site	Location	Date Surveyed	Relation to Habitat Site**	Species	General Use	Specific Use
Small Natural Ponds	A33	sand dunes	T314	Boar's Tusk NE Sec. 23 T23N R103W	May 22, 1980	W	blotched tiger salamander	breeding	feeding area
							great basin spadefoot	bearing	feeding area
							killdeer	young	feeding area
							horned lark		feeding area
Small Natural Ponds	A33	sand dunes	T70	Superior SWSE Sec. 26 T23N R101W	June 2, 1980	W	great basin spadefoot	entire cycle	feeding area
							Vesper sparrow	breeding	feeding area
Barbed Wire Fence	B02	highland sagebrush grass	T319a	Lone Tree NWSE Sec. 13 T13N R114W	July 23, 1980	W	mountain bluebird	-	feeding area
Barbed Wire Fence	B02	mountain meadow	T317a	Lone Tree NENW Sec. 24 T13N R114W	July 25, 1980	W	mountain bluebird	breeding	feeding, resting area
Building (BLM timber shack)	B09	mixed conifer	T320	Maxon Ranch NWSW Sec. 10 T12N R103W	July 17, 1980	W	-	-	-
Poles (telephone)	B19	basin big sagebrush	T112	Superior SWSE Sc. 19 T21N R101W	June 2, 1980	W	-	-	-
Poles (telephone)	B19	highland sagebrush-grass	T306	Kappes Canyon NEWE Sec. 20 T17N R104W	June 22, 1980	A	American kestrel	entire cycle	feeding area
Dirt Road	B21	big sagebrush-grass	T300	Firehole Basin NENE Sec. 14 T17N R106W	May 19, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	T118	Boar's Tusk SESE Sec. 36 T23N R103W	May 22, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	T119	Boar's Tusk NWSE Sec. 35 T23N R106W	May 22, 1980	W	-	-	-
Dirt Road	B21	saltbush-greasewood	T58a	Superior NENE Sec. 4 T21N R101W	June 2, 1980	W	-	-	-
Dirt Road	B21	saltbush-greasewood	T90	Ft. La Clede NESW Sec. 26 T17N R98W	June 11, 1980	W	-	-	-
Dirt Road	B21	big sagebrush-grass	T332	Superior SWNE Sec. 18 T21N R101W	June 16, 1980	W	-	-	-
Oirt Road	B21	limber pine	T126	Boar's Tust SWNE Sec. 8 T22N R103W	June 18, 1980	W	-	-	-
Oirt Road	B21	juniper	T77	Point of Rocks SE SWSW Sec. 22 T18N R101W	June 19, 1980	W	-	-	-
Dirt Road	B21	mountain shrub	T4	Kappes Canyon SWSE Sec. 28 T17N R104W	June 22, 1980	W	-	-	-
Dirt Road	B21	mountain shrub	T37	Currant Creek Ranch SESW Sec. 18 T14N R105W	July 3, 1980	W	-	-	-
Dirt Road	B21	mountain shrub	T40a	Currant Creek Ranch SW Sec. 17 T13N R105W	July 6, 1980	W	-	-	-
Dirt Road	B21	mixed conifer	T38a	Currant Creek Ranch NESE Sec. 17 T13N R105W	July 6, 1980	W	-	-	-
Dirt Road	B21	mixed conifer	T320	Red Creek Ranch SESE Sec. 9 T12N R103W	July 17, 1980	W	-	-	-
Dirt Road	B21	juniper	T52	Horse Ranch SWNE Sec. 21 T14N R111W	July 20, 1980	W	-	-	-
Dirt Road	B21	saltbush-greasewood	T339	Soap Holes Reservoir NENE Sec. 16 T14N R112W	July 20, 1980	W	-	-	-
Dirt Road	B21	mountain meadow	T317a	Lone Tree NENW Sec. 24 T13N R114W	July 23, 1980	W	-	-	-
Feeding Station (boxcar)	B28	saltbush-greasewood	T90	Ft. La Clede SWNE Sec. 26 T17N R98W	June 11, 1980	A	starling	breeding bearing rearing young	active nest
							American kestrel	-	roost area
Historic Stage Station		saltbush-greasewood	T90	Ft. La Clede SWNE Sec. 26 T17N R98W	June 9, 1980	A	wandering garter snake	breeding	escape cover
Historic Stage Station		badlands	T304	Haystack Flats SWNW Sec. 18 T17N R95W	June 9, 1980	A	-	-	-

**W - within site
A - adjacent to site

* A - natural feature
B - man-made feature

Appendix 13. Locations of prairie dog colonies sampled.

Code No.	Topo Map		Location
S-1	Burley Draw	7.5'	NW 1/4 Sec. 12 T15N R102W
S-2	Burley Draw	7.5'	SW 1/4 Sec. 13 T15N R102W
S-3	Burley Draw	7.5'	NE 1/4 Sec. 24 T15N R102W
S-4	Burley Draw	7.5'	SE 1/4 Sec. 24 T15N R102W
S-5	Burley Draw	7.5'	NW 1/4 Sec. 13 T15N R102W
S-6	Potter Mountain	7.5'	SW 1/4 Sec. 15 T14N R102W
S-7	Potter Mountain	7.5'	CTR. Sec. 34 T15N R102W
S-8	Burley Draw	7.5'	SE 1/4 NE 1/4 Sec. 25 T15N R102W
S-9	Mud Springs Ranch	7.5'	NE 1/4 Sec. 20 T15N R102W
S-10	Mud Springs Ranch	7.5'	SE 1/4 Sec. 4 T15N R102W
S-11	Erickson-Kent Ranch	7.5'	Sec. 11, 12, T14N R102W
S-12	Erickson-Kent Ranch	7.5'	Sec. 5, 6, 7, 8 T14N R101W
S-13	Cooper Ridge NE	7.5'	NE 1/4 Sec. 34 T17N R101W
S-14	Firehole Basin	15'	SE 1/4 SW 1/4 Sec. 20 T17N R105W
S-15	Firehole Basin	15'	NW 1/4 Sec. 20 T17N R105W
S-16	Firehole Basin	15'	NE 1/4 NW 1/4 Sec. 20 T17N R105W
S-17	Firehole Basin	15'	NW 1/4 NW 1/4 Sec. 32 T17N R105W
S-18	Firehole Basin	15'	SW 1/4 NW 1/4 Sec. 32 T17N R105W
S-19	Cooper Ridge NE	7.5'	NW 1/4 Sec. 34 T17N R101W
S-20	Cooper Ridge NE	7.5'	SW 1/4 Sec. 28 T17N R101W
S-21	Cooper Ridge NE	7.5'	E 1/2 Sec. 28 T17N R101W
S-22	Cooper Ridge NE	7.5'	NW 1/4 Sec. 28 T17N R101W
S-23	Cooper Ridge NE	7.5'	NE 1/4 Ne 1/4 Sec. 18 T17N R101W
S-24	Burley Draw	7.5'	NW 1/4 NE 1/4 Sec. 23 T16N R102W
S-25	Burley Draw	7.5'	SE 1/4 NW 1/4 Sec. 23 T16N R102W
S-26	Cooper Ridge NE	7.5'	SE 1/4 Sec. 20 T17N R101W
S-27	Sand Butte Rim NW	7.5'	NW 1/4 NW 1/4 Sec. 7 T17N R100W
S-28	Bitter Creek	7.5'	SE 1/4 SE 1/4 Sec. 12 T18N R100W
S-29	Sand Butte Rim NW	7.5'	NW 1/4 Sec. 8 T17N R100W
S-30	Sand Butte Rim NW	7.5'	SE 1/4 Sec. 4 T17N R100W
S-31	Burley Draw	7.5'	Sec. 14, 22, 26, 27 T16N R102W
S-31	Cooper Ridge NE	7.5'	Sec., 2, 11 T16N R102W
S-31	Mud Springs Ranch	7.5'	Sec., 22, 27, 34 T16N R102W
S-32	Mud Springs Ranch	7.5'	SE 1/4 NE 1/4 Sec. 34 T16N R102W
S-33	Cooper Ridge NE	7.5'	SE 1/4 NE 1/4 Sec. 30 T17N R101W
S-34	Sand Butte Rim NW	7.5'	SE 1/4 Sec. 18 T17N R100W
S-35	Cooper Ridge NE	7.5'	SW 1/4 NE 1/4 Sec. 30 T17N R101W
S-36	Sand Butte Rim NW	7.5'	SE 1/4 Sec. 8 T17N R100W
S-37	Cooper Ridge NE	7.5'	NE 1/4 SE 1/4 Sec. 30 T17N R101W
S-38	Cooper Ridge NE	7.5'	SW 1/4 NE 1/4 Sec. 30 T17N R101W
S-39	Cooper Ridge NE	7.5'	NW 1/4 NW 1/4 Sec. 12 T18N R100W
S-40	Black Buttes	7.5'	SW 1/4 NW 1/4 Sec. 14 T18N R100W

APPENDIX 14

Bird, amphibian and reptile sampling dates and locations

MIXED CONIFER

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-128	June 9,10,11 1980	10	Pine Butte	SW Sec. 33 T16N R100W
T-310	July 3,4,5	5	Maxon Ranch	NW Sec. 33 T14N R105W
T-38a	July 6,7,8	5	Currant Creek Ranch	SE Sec. 17 T13N R105W
T-36	July 6,7,8	5	Currant Creek Ranch	SE Sec. 19 T13N R105W
T-320	July 17,18,19	5	Red Creek Ranch	SE Sec. 9 T12N R103W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-23	June 7,10; August 11	10	Pine Butte	SW Sec. 33 T16N R100W
H-13	June 30; July 4; Aug 2	5	Maxon Ranch	NW Sec. 33 T14N R105W
H-84	July 3,7	5	Currant Creek Ranch	SE Sec. 17 T13N R105W
H-85	July 1	5	Currant Creek Ranch	SE Sec. 19 T13N R105W
H-92	July 6	5	Red Creek Ranch	SE Sec. 9 T12N R103W

LIMBER PINE

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-126	June 16,17,18	10	Boars Tusk	NE Sec. 8 T22N R103W
T-57	June 16,17,18	10	Superior	SE Sec. 10 T23N R102W
T-114	June 19,20,21	5	Superior	NE Sec. 27 T21N R102W
T-72	June 19,20,21	5	Point of Rocks SE	SW Sec. 9 T18N R101W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-55	May 10; June 16,17	10	Boars Tusk	NE Sec . 8 T22N R103W
H-73	June 15, 16,17	10	Superior	SE Sec. 10 T23N R102W
H-74	June 10	5	Superior	NE Sec. 27 T21N R102W
H-75	June 18	5	Point of Rocks SE	SW Sec. 27 T21N R102W

JUNIPER

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-20a	May 19,20,21	5	Firehole Basin	NE Sec. 10 T16N R106W
T-302	May 19,20,21	5	Firehole Basin	SE Sec. 23 T17N R106W
T-77	June 19,20,21	5	Point of Rocks SE	SW Sec. 22 T18N R101W
T-14	June 22,23,24	10	Kappes Canyon	SE Sec. 29 T15N R104W
T-52	July 20,21,22	10	Horse Ranch	NE Sec. 21 T14N R111W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-3	May 5; July 31	5	Firehole Basin	SE Sec. 23 T17N R106W
H-49	May 5; June 29	5.7	Firehole Basin	NW Sec. 26 T17N R106W
H-8	May 6	5	Firehole Basin	NE Sec. 10 T16N R106W
H-56	June 6,19,20	5	Point of Rocks SE	SW Sec. 22 T18N R101W
H-15	June 19,26; August 3	10	Kappes Canyon	NE Sec. 13 T17N R105W
H-95	July 14	10	Horse Ranch	NE Sec. 21 T14N R111W
H-1	July 31	15.4	Firehole Basin	NE Sec. 2 T17N R106W
H-2	July 31	13.4	Firehole Basin	NW Sec. 23 T17N R106W
H-4	July 31	4	Firehole Basin	NE Sec . 1 T17N R106W
H-59	August 1	0.4	Firehole Basin	NW Sec. 31 T17N R105W
H-17	August 3	2.4	Kappes Canyon	NE Sec. 14 T17N R105W
H-16	August 3	2	Kappes Canyon	SE Sec. 14 T17N R105W
H-40	August 31	32.4	Boars Tusk	SE Sec. 18 T22N R103W
H-44	September 4	44.9	Point of Rocks	SW Sec. 33 T20N R101W
H-45	September 4	4	Point of Rocks	NE Sec. 8 T19N R101W
H-46	September 4	2.8	Point of Rocks	NW Sec. 8 T19N R101W

MOUNTAIN SHRUB

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-4	June 22,23,24	2.5	Kappes Canyon	SE Sec. 28 T17N R104W
T-37	July 3,4,5	5	Currant Creek Ranch	SW Sec. 18 T14N R105W
T-12a	July 3,4,5	10	Maxon Ranch	NW Sec. 33 T14N R105W
T-336	July 17,18,19	10	Four J Rim	SW Sec. 6 T12N R102W
T-318	July 23,24,25	5	Table Mountain	NE Sec. 33 T13N R114W
T-341	July 23,24,25	2.5	Lone Tree	SW Sec. 24 T13N R114W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-18	June 19; August 3	2.5	Kappes Canyon	SE Sec. 28 T17N R104W
H-81	June 30	5	Currant Creek Ranch	SW Sec. 18 T14N R105W
H-82	June 30	10	Maxon Ranch	NW Sec. 33 T14N R105W
H-93	July 6	10	Four J Rim	SW Sec. 6 T12N R102W
H-98	July 22,24	5	Table Mountain	NE Sec. 33 T13N R114W
H-99	July 22	2.5	Lone Tree	SW Sec. 24 T13N R114W
H-48	July 22	1.6	Horse Ranch	NE Sec. 19 T14N R111W

SALTBUSH-GREASEWOOD

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-301a	May 19,20,21	10	Firehole Basin	NE Sec. 4 T16N R104W
T-122	May 22,23,24	5	Boars Tusk	NE Sec. 5 T22N R103W
T-58a	June 2,3,4	10	Superior	NE Sec. 4 T21N R101W
T-331	June 6,7,8	10	Antelope Flats	SW Sec. 36 T18N R99W
T-90	June 9,10,11	10	Ft. La Clede	NE Sec. 26 T17N R98W
T-339	July 20,21,22	5	Soap Holes Reservoir	NE Sec. 16 T14N R112W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-7	May 6,19,20,21	10	Firehole Basin	NE Sec. 4 T16N R104W
H-39	May 9,23; August 31	5	Boars Tusk	NE Sec. 5 T22N R103W
H-66	May 10	10	Superior	NE Sec. 4 T21N R101W
H-32	June 2; August 14	10	Antelope Flats	SW Sec. 36 T18N R99W
H-52	June 3,10	10	Ft. La Clede	NE Sec. 26 T17N R98W
H-96	July 14	5	Soap Holes Reservoir	NE Sec. 16 T14N R112W
H-10	August 1	0.4	Firehole Basin	SW Sec. 7 T15N R106W
H-60	August 2	17.8	Burley Draw	NW Sec. 12 T15N R102W
H-22	August 4	36.4	Boars Tusk	CTR Sec. 4 T22N R104W
H-25	August 13	9.7	Scrivner Butte	SW Sec. 24 T13N R102W
H-33	August 16	15	Ft. La Clede	NW Sec. 31 T17N R97W
H-35	August 18	4	Bitter Creek NW	NW Sec. 30 T20N K100W
H-36	August 18	30.8	Point of Rocks	NW Sec. 10 T20N R101W
H-37	August 18	5.3	Superior	NE Sec. 36 T21N R101W
				NW Sec. 28 T20N R101W
H-43	September 3	0.8	Point of Rocks	CTR. Sec. 8 T20N R101W
H-42	September 3	0.4	Superior	SE Sec. 33 T22N R101W

BASIN BIG SAGEBRUSH-GRASS

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-112	June 2,3,4	5	Superior	SE Sec. 19 T21N R101W
T-303	June 6,7,8,18	5	Ft. La Clede	NE Sec. 7 T17N R98W
T-33	June 30; July 1,2	5	South Baxter	SE Sec. 25 T16N R104W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-67	May 10	5	Superior	SE Sec. 19 T21N R101W
H-70	May 31	5	Ft. la Clede	NE Sec. 7 T17N R98W
H-20	June 22	5	South Baxter	SE Sec. 25 T16N R104W

BIG SAGEBRUSH-GRASS

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-300	May 19,20,21	10	Firehole Basin	NE Sec. 14 T17N R106W
T-118	May 22,23,24	10	Boars Tusk	SE Sec. 36 T23N R103W
T-119	May 22,23,24	10	Boars Tusk	NE Sec. 35 T23N R103W
T-59	June 2,3,4	10	Superior	NE Sec. 33 T22N R101W
T-332	June 16,17,18	10	Superior	NW Sec. 19 T21N R101W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-6	May 5; July 31	10	Firehole Basin	NE Sec. 14 T17N R106W
H-63	May 8	10	Boars Tusk	SE Sec. 36 T23N R103W
H-64	May 8	10	Boars Tusk	NE Sec. 35 T23N R103W
H-65	May 10	10	Superior	NE Sec. 33 T22N R101W
H-50	May 19; June 10	10	Superior	NW Sec. 19 T21N R101W
H-47	July 21	6.9	Horse Ranch	SE Sec. 20 T14N R111W
H-9	August 1	2	Firehole Basin	SW Sec. 23 T16N R107W
H-11	August 1	44.5	Firehole Basin	SE Sec. 12 T15N R107W
H-57	August 1	0.4	Firehole Basin	NW SEc. 7 T17N R105W
H-58	August 1	0.4	Firehole Basin	SW SEc. 9 T15N R106W
H-61	August 3	16.6	Burley Draw	NE Sec. 24 T15N R102W
H-28	August 13	1.6	Red Creek Ranch	SE Sec. 20 T12N R103W
H-29	August 13	0.4	Red Creek Ranch	SW Sec. 21 T12N R103W
H-30	August 13	0.4	Red Creek Ranch	SE Sec. 21 T12N R103W
H-62	August 26	0.4	Sand Butte Rim NW	NW Sec. 7 T17N R100W

HIGHLAND SAGEBRUSH-GRASS

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-85a	June 6, 7, 8	10	Antelope Flats	NW Sec. 4 T16N R 99W
T-306	June 22, 23, 24	10	Kappes Canyon	NE Sec. 20 T17N R104W
T-327	July 17, 18, 19	10	Four J Rim	SE Sec. 2 T12N R103W
T-319a	July 23, 24, 25	10	Lone Tree	SE Sec. 13 T13N R114W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
T-128	June 9,10,11 1980	10	Pine Butte	SW Sec. 33 T16N R100W
H-69	June 2	10	Antelope Flats	NW Sec. 4 T16N R 99W
H-77	June 19	10	Kappes Canyon	NE Sec. 20 T17N R104W
H-90	July 6	10	Four J Rim	SE Sec. 2 T12N R103W
H-100	July 22	10	Lone Tree	SE Sec. 13 T13N R114W

ASPEN

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-316	June 9, 10, 11	10	Pine Butte	SW Sec. 33 T16N R100W
T-111	June 16, 17, 18	5	Superior	NW Sec. 19 T21N R101W
T-371	June 16, 17, 18	2	Superior	NE Sec. 10 T23N R102W
T-6	June 22, 23, 24	5	Kappes Canyon	NW Sec. 27 T17N R104W
T-35	July 6, 7, 8	5	Currant Creek Ranch	SW Sec. 7 T13N R105W
T-335	July 14, 15, 16	5	Red Creek Ranch	SW Sec. 17 T12N R103W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-103	May 19; June 9,10	5	Superior	NW Sec. 19 T21N R101W
H-71	June 7, 10	10	Pine Butte	SW Sec. 33 T16N R100W
H-72	June 15,16,17	2	Superior	NE Sec. 10 T23N R102W
H-78	June 19	5	Kappes Canyon	NW Sec. 27 T17N R104W
H-86	July 3	5	Currant Creek Ranch	SW Sec. 7 T13N R105W
H-88	July 7	5	Red Creek Ranch	SW Sec. 17 T12N R103W

RIPARIAN FOREST

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-329	June 22, 23, 24	2.5	Lion Bluffs	NW Sec. 19 T17N R103W
T-309a	June 30; July 1,2	5	Maxon Ranch	SE Sec. 29 T15N R104W
T-311a	July 3,4,5,	7.5	Maxon Ranch	SE Sec. 28 T14N R105W
T-321a	July 14, 15,16	2.5	Red Creek Ranch	SW Sec. 12 T12N R104W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-79	June 20, 23	2.5	Lion Bluffs	NW Sec. 19 T17N R103W
H-14	June 22; July 1; Aug. 2	5	Maxon Ranch	SE Sec. 29 T15N R104W
H-102	July 3; Aug. 2	7.5	Maxon Ranch	SE Sec. 28 T14N R105W
H-87	July 4, 15	2.5	Red Creek Ranch	SW Sec. 12 T12N R104W
H-31	August 13	0.4	Red Creek Ranch	NW Sec. 17 T12N R103W

RIPARIAN SHRUB

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-307a	June 30; July 1, 2	2.5	Earnest Butte	NE Sec. 16 T16N R104W
T-312	July 3,4,5	5	Currant Creek Ranch	NW Sec. 20 T14N R105W
T-337	July 17,18,19	5	Scrivner Butte	NE Sec. 14 T13N R102W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-19	June 22	2.5	Earnest Butte	NE Sec. 16 T16N R104W
H-12	June 30; July 5, Aug. 2	5	Currant Creek Ranch	NW Sec. 20 T14N R105W
H-24	July 16,18; Aug. 12	5	Scrivner Butte	NE Sec. 14 T13N R102W

RIPARIAN MEADOW

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-92	June 6,7,8	10	Antelope Flats	NW Sec. 6 T17N R 98W
T-86a	June 6,7,8	5	Antelope Flats	SE Sec. 3 T16N R 99W
T-308a	June 30; July 1,2	10	Maxon Ranch	NE Sec. 7 T14N R104W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-106	May 31, Aug. 14	10	Antelope Flats	NW Sec. 6 T17N R 98W
H-68	May 31	5	Antelope Flats	SE Sec. 3 T16N R 99W
H-80	June 22	10	Maxon Ranch	NE Sec. 7 T14N R104W
H-21	August 4	2.4	Lion Bluffs	SE Sec. 24 T17N R104W
H-26	August 13	22.3	Scrivner Butte	SE Sec. 23 T13N R102W

MOUNTAIN MEADOW

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-40a	July 6,7,8	10	Currant Creek Ranch	SW Sec. 17 T13N R105W
T-340	July 14,15,16	10	Red Creek Ranch	SW Sec. 21 T12N R103W
T-334	July 17,18,19	10	Red Creek Ranch	NW Sec. 15 T12N R103W
T-317a	July 23,24,25	10	Lone Tree	NW Sec. 24 T13N R114W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H 83	July 5	10	Currant Creek Ranch	SW Sec. 17 T13N R105W
H-91	July 6	10	Red Creek Ranch	NW Sec. 15 T12N R103W
H-89	July 7	10	Red Creek Ranch	SW Sec. 21 T12N R103W
H-101	July 22	10	Lone Tree	NW Sec. 24 T13N R114W

BADLANDS

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-304	June 9,10,11	10	Haystack Flats	NW Sec. 18 T17N R95W
T-305	June 9,10,11	10	Haystack Flats	SE Sec. 18 T17N R95W
T-328	July 14,15,16	10	Red Creek Ranch	NW Sec. 24 T13N R104W
T-55a	July 20,21,22	10	Soap Holes Reservoir	NW Sec. 4 T14N R112W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-53	June 8,9,10	10	Haystack Flats	NW Sec. 18 T17N R95W
H-105	June 8,9,10	10	Haystack Flats	SE Sec. 18 T17N R95W
H-27	July 4; Aug. 13	10	Red Creek Ranch	NW Sec. 24 T13N R104W
H-97	July 14	10	Soap Holes Reservoir	NW Sec. 4 T14N R112W
				Sec. 19,20 T16N R 96W
H-34	August 17	416.6	Manuel Gap	NW Sec 24, 25 T16N R97W
			Barrel Springs	NW Sec. 19, 30 T16N R96W

OUTCROP

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-29a	May 19,20,21	4.5	Firehole Basin	SE Sec . 1 T17N R106W
T-110	June 2,3,4	10	Superior	NE Sec. 13 T21N R101W
T-74	June 19,20,21	5	Black Buttes	SE Sec. 30 T18N R100W
T-338	July 20,21,22	5	Horse Ranch	SW Sec. 24 T14N R111W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-5	May 5,20; July 31	4.5	Firehole Basin	SE Sec. 1 T17N R106W
H-38	May 19; August 19	10	Superior	NE Sec. 13 T21N R101W
H-76	June 6,19,20	5	Black Buttes	SE Sec. 30 T18N R100W
H-94	July 19	5	Horse Ranch	SW Sec. 24 T14N R111W

SAND DUNE

Birds

Transect	Dates Surveyed	Ha	Topo Map	Location
T-313	May 22,23,24	10	Boars Tusk	SE Sec. 23 T23N R103W
T-314	May 22,23,24	10	Boars Tusk	NE Sec. 23 T23N R103W
T-65	June 2,3,4	10	Superior	NW Sec. 36 T23N R101W
T-70	June 2,3,4	10	Superior	SE Sec. 26 T23N R101W

Amphibians and Reptiles

Site	Dates Surveyed	Ha	Topo Map	Location
H-41	May 9,22,24; June 15; Sept. 1,2	10	Boars Tusk	SE Sec. 23 T23N R103W
H-104	May 9,22,24; Sept. 1,2	10	Boars Tusk	NE Sec. 23 T23N R103W
H-51	May 22	10	Superior	NW Sec. 36 T23N R101W
H-54	May 22	10	Superior	SE Sec. 26 T23N R101W

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